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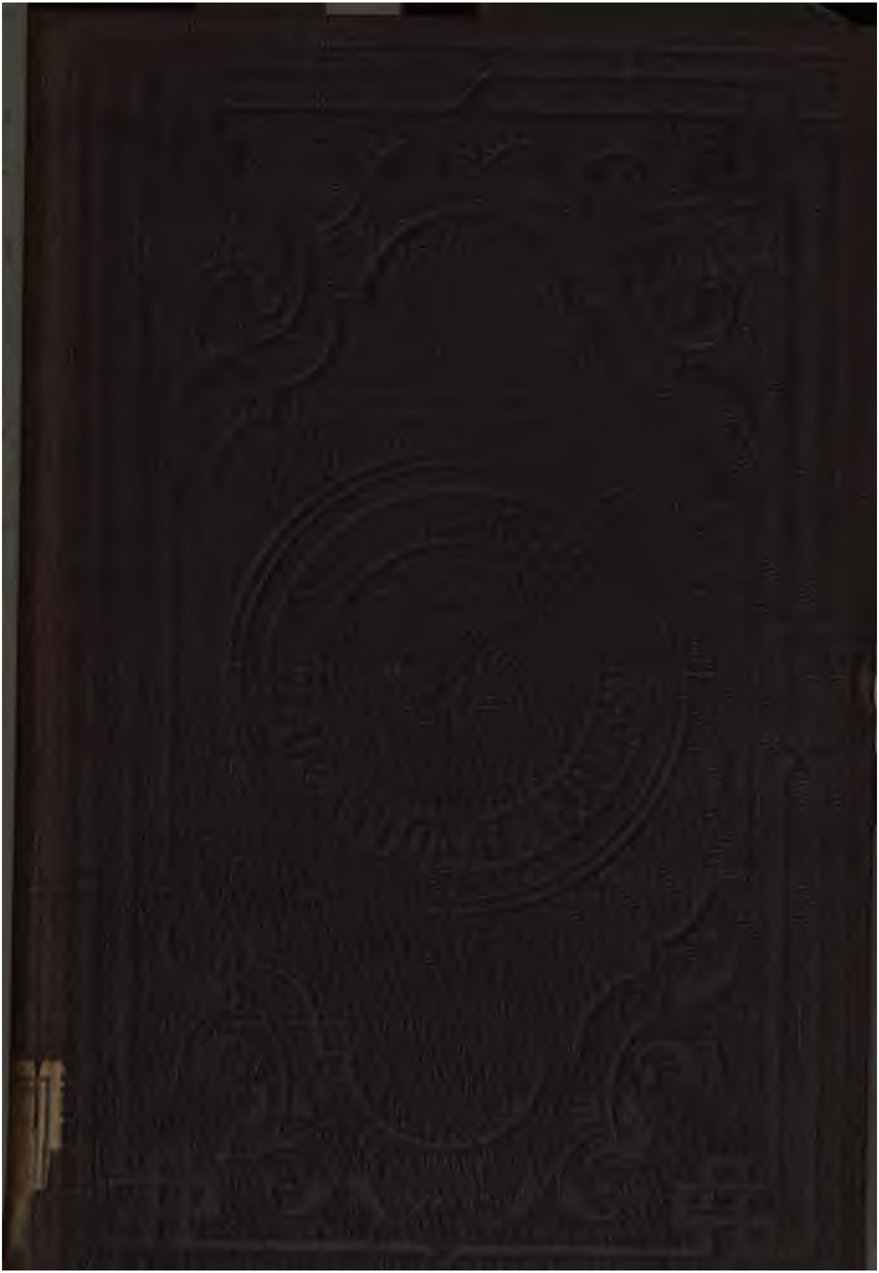

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TO

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KEY TO ARITHMETIC.

EXERCISES ON SIMPLE ADDITION, &c.

Page 35.

(1)

$$\begin{array}{r}
6702 \\
15926 \\
\underline{2739389} \\
2762017 \\
6745 \\
\hline
1729\,)\,18629804665 \\
\hline
10774901\frac{836}{1729}
\end{array}$$

(2) $1894 + 37592 + 1006 + 283597 + 8463925 + 173964 + 2157184 + 327 = 11119489$

$$\begin{array}{rr}
\text{Sub.} & \underline{3578961} \\
 & 7540528 \\
 & \underline{78359} \\
 & 590868233552 \div 9385 = 62958788\frac{8172}{9385}
\end{array}$$

(3)

$$\begin{array}{rr}
 & 237965843 \\
 & 3921726 \\
140942 & 58379 \\
\underline{71689} & \underline{83796254} \\
69253 &)\,325742202 \\
\hline
 & 4703\frac{45343}{69253}
\end{array}$$

(4) $$\frac{675392619 \times 8735}{54321} = \frac{5899554526965}{54321} = 108605410\frac{50355}{54321}$$

(5) $$\frac{65354 - 17916}{5927} = \frac{47438}{5927} = 8\frac{22}{5927}$$

(6)
$$\frac{186922242 + 3577875 + 106 - 79583}{92085}$$
$$\frac{190500223 - 79583}{92085} = \frac{190420640}{92085} = 2067\tfrac{80945}{92085}$$

(7)
$$\frac{82 \times 43 + 5013 \div 9}{85 - (8 + 28)} = \frac{3526 + 557}{85 - 36} = \frac{4083}{49} = 83\tfrac{16}{49}$$

(8)
$$\frac{2.\ 3.\ 4.\ 5.\ 6.\ 7.\ 8.\ 9}{12.\ 13.\ 14} = \frac{362880}{2184} = 166\tfrac{336}{2184}$$

(9)
$$\begin{array}{rr} 71 & 731 \\ 24 & 437 \\ \hline 1704 & 319447 \\ 89 & 596 \\ \hline 151656 &)190390412 \\ & \overline{1255\tfrac{62132}{151656}} \end{array}$$

COMPOUND MULTIPLICATION.

Page 62.

(19)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	1	19	5¼	× 9 =	17	14	11¼	(1)	× 5 =	9	17	2¼
		10										
(2)	19	14	4½	× 7 =	138	0	7½	(2)	× 4 =	78	17	6
		10										
(3)	197	3	9	× 3 =	591	11	3	(3)	× 8 =	1577	10	0
					£747	6	9¾			£1666	4	8¼

(20)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	7	3	10¾	× 2 =	14	7	9½	(1)	× 1 =	7	3	10¾
			10									
(2)	71	18	11½	× 3 =	215	16	10½	(2)	× 9 =	647	10	7½
			10									
(3)	719	9	7	× 9 =	6475	6	3	(3)	× 6 =	4316	17	6
					£6705	10	11			£4971	12	0¼

(21)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	2	16	9½	× 2 =	5	13	7	(1)	× 6 =	17	0	9
			10									
(2)	28	7	11	× 0				(2)	× 9 =	255	11	3
			10									
(3)	283	19	2	× 7 =	1987	14	2	(3)	× 3 =	851	17	6
					£1993	7	9			£1124	9	6

(22)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	0	17	9¼	× 4 =	3	11	1	(1)	× 8 =	7	2	2
			10									
(2)	8	17	8½	× 3 =	26	13	1½	(2)	× 7 =	62	3	11½
			10									
(3)	88	17	1	× 2 =	177	14	2	(3)	× 6 =	533	2	6
			10									
(4)	888	10	10	× 1 =	888	10	10	(4)	× 5 =	4442	14	2
					£1096	9	2½			£5045	2	9½

(23)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	4	4	6½	×5=	21	2	8½	(1)	× 2 =	8	9	1
			10									
(2)	42	5	5	×0				(2)	× 8 =	338	3	4
			10									
(3)	422	14	2	×0				(3)	× 0			
			10									
(4)	4227	1	8	×3=	12681	5	0	(4)	× 7 =	29589	11	8
					£12702	7	8½			£29936	4	1

(24)

	£	s.	d.		£	s.	d.			£	s.	d.
(1)	3	15	11¼	×3=	11	7	9¾	(1)	× 0			
			10									
(2)	37	19	4½	×0				(2)	× 4 =	151	17	6
			10									
(3)	379	13	9	×8=	3037	10	0	(3)	× 8 =	3037	10	0
			10									
(4)	3796	17	6	×9=	34171	17	6	(4)	× 5 =	18984	7	6
					£37220	15	3¾			£22173	15	0

	£	s.	d.			£	s.	d.
(53)	2	9	6½	× 6	=	14	17	3
			10					
	24	15	5	× 3	=	74	6	3
			10					
	£247	14	2	× 9	=	2229	7	6
						£2318	11	0

	£	s.	d.			£	s.	d.
(54)	1	19	11¼	× 3	=	5	19	9¾
			10					
	19	19	4½	× 1	=	19	19	4½
			10					
	£199	13	9	× 2	=	399	7	6
						£425	6	8¼

	£	s.	d.			£	s.	d.
(55)	12	1	2¾	× 9	=	108	11	0¾
			10					
	120	12	3½	× 4	=	482	9	2
			10					
	£1206	2	11	× 5	=	6030	14	7
						£6621	14	9¾

	£	s.	d.			£	s.	d.
(63)	18	15	6¾	× 0				
			10					
	187	15	7½	× 8	=	1502	5	0
			10					
	£1877	16	3	× 1	=	1877	16	3
						£3380	1	3

	£	s.	d.			£	s.	d.
(65)	2	19	4¼	× 28	=	83	1	11
	2	4	6¼	× 19	=	42	5	10¾
	1	9	10¾	× 30	=	44	16	10½
						£170	4	8¼

(66) Total number of weeks = 637 × 52 = 33124.

£	s.	d.			£	s.	d.
1	3	6	× 4	=	4	14	0
		10					
11	15	0	× 2	=	23	10	0
		10					
117	10	0	× 1	=	117	10	0
		10					
1175	0	0	× 3	=	3525	0	0
		10					
11750	0	0	× 3	=	35250	0	0
					£38920	14	0

(67) Total number of weekly reliefs = 170 × 52 = 8840.

£	s.	d.			£	s.	d.
0	3	3	× 0				
		10					
1	12	6	× 4	=	6	10	0
		10					
16	5	0	× 8	=	130	0	0
		10					
162	10	0	× 8	=	1300	0	0
					£1436	10	0

(68)

qr.	bush.	pk.			qr.	bush.	pk.
4	5	3	× 2	=	9	3	2
		10					
47	1	2	× 5	=	235	7	2
					245	3	0

(69)

miles.	fur.	perch.			miles.	fur.	perch.
9	6	20	× 2	=	19	5	0
		10					
98	1	0	× 1	=	98	1	0
		10					
981	2	0	× 3	=	2943	6	0
					3061	4	0 = 3061½ miles.

(70)

	cwt.	qr.	lb.	oz.
	10	2	27	11
				3
	32	0	27	1
				9
Tons 14	10	0	19	9

	days.	ho.	min.	sec.			days.	ho.	min.	sec.
(71)	29	12	44	2⅘	× 5	=	147	15	40	14
				10						
	295	7	20	28	× 3	=	885	22	1	24
				10						
	2953	1	24	40	× 2	=	5906	2	49	20
							6939	16	30	58

	days.	ho.			days.	ho.	min.	sec.
(72)	365	6	× 9	=	3287	6	0	0
		10						
	3652	12	× 1	=	3652	12	0	0
					6939	18	0	0
By last question, 235 lunar months				=	6939	16	30	58
						1	29	2 = diff.

	£	s.	d.			£	s.	d.
(73)	8	3	9¾	× 5	=	40	19	0¾
			10					
	81	18	1½	× 7	=	573	6	10½
			10					
	819	1	3	× 9	=	7371	11	3
			10					
	8190	12	6	× 0				
			10					
	81906	5	0	× 5	=	409531	5	0
						£417517	2	2¼

	£	s.	d.			£	s.	d.
(74)	1	5	8½	× 3	=	3	17	1½
			10					
	12	17	1	× 5	=	64	5	5
			10					
	128	10	10	× 7	=	899	15	10
			10					
	1285	8	4	× 4	=	5141	13	4
			10					
	12854	3	4	× 2	=	25708	6	8
			10					
	128541	13	4	× 6	=	771250	0	0
						£803067	18	4½

(75)

$$\begin{array}{rrrlcrrr}
\pounds & s. & d. & & & \pounds & s. & d. \\
23 & 10 & 3 & \times 6 & = & 141 & 1 & 6 \\
 & & 10 & & & & & \\
\hline
235 & 2 & 6 & \times 8 & = & 1881 & 0 & 0 \\
 & & 10 & & & & & \\
\hline
2351 & 5 & 0 & \times 6 & = & 14107 & 10 & 0 \\
 & & 10 & & & & & \\
\hline
23512 & 10 & 0 & \times 9 & = & 211612 & 10 & 0 \\
 & & 10 & & & & & \\
\hline
235125 & 0 & 0 & \times 1 & = & 235125 & 0 & 0 \\
\cline{6-8}
 & & & & & \pounds 462867 & 1 & 6
\end{array}$$

COMPOUND DIVISION.

Page 69.

(52)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 3\frac{1}{2})36 & 13 & 5\frac{1}{4} & \\
\text{Mult. by} & 2 & & 2 & \\
\hline
 & 7\,)\,73 & 6 & 10\frac{1}{2} & \\
\hline
 & 10 & 9 & 6\frac{1}{2} & \frac{4}{7}
\end{array}$$

(53)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 4\frac{1}{4})58 & 6 & 7\frac{3}{4} & \\
\text{Mult. by} & 4 & & 4 & \\
\hline
 & 17)233 & 6 & 7 & \\
\hline
 & 13 & 14 & 6\frac{0}{4} & \frac{4}{17}
\end{array}$$

(54)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 6\frac{3}{4})87 & 12 & 10\frac{1}{2} & \\
\text{Mult. by} & 4 & & 4 & \\
\hline
 & 27)350 & 11 & 6 & \\
\hline
 & 12 & 19 & 8\frac{0}{4} & \frac{8}{9}
\end{array}$$

(55)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 7\frac{2}{3})71 & 4 & 8 & \\
\text{Mult. by} & 3 & & 3 & \\
\hline
 & 23)213 & 14 & 0 & \\
\hline
 & 9 & 5 & 9\frac{3}{4} & \frac{15}{23}
\end{array}$$

(56)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 12\frac{3}{7})138 & 11 & 3\frac{3}{4} & \\
\text{Mult. by} & 7 & & 7 & \\
\hline
 & 87\,)\,969 & 19 & 2\frac{1}{4} & \\
\hline
 & 11 & 2 & 11\frac{3}{4} &
\end{array}$$

(57)

$$\begin{array}{lrrrl}
 & \pounds & s. & d. & \\
 & 26\frac{1}{5})754 & 10 & 6 & \\
\text{Mult. by} & 5 & & 5 & \\
\hline
 & 134)3772 & 12 & 6 & \\
\hline
 & 28 & 3 & 0\frac{3}{4} & \frac{51}{67}
\end{array}$$

EXERCISES ON COMPOUND ADDITION, &c.

Page 72.

(2)

				£	s.	d.
The lady took to market, . .				5	3	11
She laid out—						
On groceries, .	£0	18	4½			
... bread, .	0	12	5¼			
... beef, . .	1	6	3			
... other articles,	0	4	11			
Whole sum expended, . . .				3	1	11¾
Sum remaining, ...				£2	1	11¼

(3)

	£	s.	d.			
The tradesman owes to A,	53	7	6			
... ... B,	105	10	0			
... ... C,	34	5	2			
... ... D,	28	16	5			
... ... E,	14	15	8			
... ... F,	112	9	0			
... ... G,	143	12	9			
Whole debt, ...				£492	16	6
His stock valued at .	£212	6	0			
Debts due to him, . .	112	8	3			
Money in hand, . .	21	10	5			
Value of his effects, . . .				346	4	8
∴ His creditors lose, . .				£146	11	10

(4)

	£	s.	d.
Annual income, ...	1200	0	0
Annual expenditure, £1 17 5¾ × 365 =	683	19	10¾
∴ He saves yearly, . .	£516	0	1¼

	£	s.	d.
52)	516	0	1¼
	£9	18	5½ $\frac{13}{52}$

	£	s.	d.
365)	516	0	1¼
	£1	8	3¼ $\frac{60}{365}$

(5)		£	s.	d.
	Annual income, .	460	0	0
	... saving, . .	53	19	6
		52)406	0	6
	Weekly expenditure =	7	16	$1\frac{3}{4}\,\frac{11}{13}$
		365)406	0	6
	Daily, . =	£1	2	$2\frac{3}{4}\,\frac{329}{365}$

(6)	£	s.	d.		£	s.	d.	
	2	16	11	× 39 =	110	19	9	
	2	4	$7\frac{3}{4}$	× 23 =	51	6	$10\frac{1}{4}$	
				62	)162	6	$7\frac{1}{4}$	money received.
					£2	12	$4\frac{1}{4}\,\frac{31}{62}$	average price.

(7)	£	s.	d.		£	s.	d.	
	73	10	6	× 45 =	3308	12	6	= money paid away.
	65	17	9	× 45 =	2964	18	9	= ... received.
				∴	£343	13	9	= loss.

(8)	£	s.	d.		£	s.	d.	
	7	6	3	× 10 =	73	2	6	
	7	1	$9\frac{1}{2}$	× 8 =	56	14	4	
	6	15	0	× 17 =	114	15	0	
	6	11	$4\frac{1}{2}$	× 23 =	151	1	$7\frac{1}{2}$	
	5	18	7	× 9 =	53	7	3	
					67)449	0	$8\frac{1}{2}$	value of the cargo.
					£6	14	$0\frac{1}{4}\,\frac{63}{67}$	average price.

(9)	yd.		s.	d.		£	s.	d.
	739	at	0	$5\frac{3}{4}$	per yard =	17	14	$1\frac{1}{4}$
	69	at	4	$7\frac{1}{2}$	... =	15	19	$1\frac{1}{2}$
	73	at	3	9	... =	13	13	9
						£47	6	$11\frac{3}{4}$

(10)

	£	s.	d.	£	s.	d.
Income, ...				160	0	0
Expenditure—	£	s.	d.			
House rent, . .	19	10	0			
Taxes, ...	5	3	7½			
Grocer's account, .	15	11	3			
Baker's do., ...	7	17	5			
Butcher's do., . .	14	1	3¾			
Shoemaker's do., . . .	6	5	9			
Tailor's do., . .	8	1	5½			
Draper's do., . . .	5	13	11¾			
Income-tax, . .	4	13	4			
Miscellaneous expenses,	46	14	10½			
Whole expenditure, ...				133	13	0
∴ He saves, . . .				£26	7	0

(11) £5 3 11 × 39 = £202 12 9

(12)

	£	s.	d.
365 days, at 3s. 10½d. per day =	70	14	4½
Subtract	23	0	0
365)	47	14	4½
	£0	2	$7\frac{1}{4}\frac{185}{365}$

(13)

		£	s.	d.		£	s.	d.
Took in his pocket,		5	3	6				
Recd. at	York, .	49	13	9	expenses there,	0	15	3½
...	Sunderland,	51	11	5½	...	2	5	9
...	Durham,	179	13	10¾	...	2	10	6
...	Newcastle,	91	7	9½	...	1	3	9
...	Carlisle,	275	10	11½	...	3	6	4
		653	1	4¼		£10	1	7½
		10	1	7½				
		£642	19	8¾				

(14) £50 − £34 11 5 = £15 8 7

(15)

	£	s.	d.
£95	95	0	0
14 crowns, ...	3	10	0
23 half-crowns, . . .	2	17	6
19 shillings, ...	0	19	0
15 sixpences, . . .	0	7	6
11 fourpences, ...	0	3	8
12)	102	17	8
	£8	11	$5\frac{1}{2}\frac{8}{12}$

(16)

s.	d.
23	7
18	3½
5	3½

5 3½ × 52 = £13 15s. 2d.

(17)

	£	s.	d.
Annual income, . .	1000	0	0
£1 17 3½ × 365 .	680	11	5½
He saves in 1 year, .	319	8	6½
			9
... ... 9 . .	2874	16	10½

(18)

	lb.	oz.	dwt.	gr.
1869)	40	0	0	0
	0	0	5	$3\frac{513}{1869}$

INVOICES.

Page 74.

(1)

£	s.	d.
15	11	0
6	4	8
0	16	10
1	4	2
0	18	11½
0	15	11¾
£25	11	7¼

(2)

£	s.	d.
35	18	6
47	13	6½
22	9	3¼
22	4	1½
23	10	10
6	2	3½
£157	18	6¾

(3)

£	s.	d.
42	1	6
43	0	5
38	18	10¾
26	18	11½
40	2	11
6	11	8
£197	14	4¼

(4)

£	s.	d.
63	0	0
150	0	0
44	11	0
27	19	0
66	6	0
100	12	6
£452	8	6

(5)

£	s.	d.
52	0	3
3	2	6
8	4	0½
106	13	10½
46	1	10½
15	18	3
£232	0	9½

(6)

£	s.	d.
2	9	10½
8	3	4
16	9	2
25	10	0
26	2	6
36	6	9
£115	1	7½

(7)

£	s.	d.
3	7	6
10	10	8¾
3	2	6½
28	0	8
28	7	0½
153	9	0
£226	17	5¾

(8)

£	s.	d.
5	15	6
3	5	0
0	17	6
7	9	0
2	15	6
2	17	4
10	7	9
£33	7	7

MULTIPLICATION OF VULGAR FRACTIONS.

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(13)

$$\begin{array}{llll} \pounds & s. & d. & & \pounds & s. & d. \\ 1 & 3 & 9\frac{1}{2} & \times\ 27 = & 32 & 2 & 4\frac{1}{2} \\ 1 & 3 & 9\frac{1}{2} & \times\ \frac{3}{4} = & 0 & 17 & 10\frac{0}{4}\ \frac{1}{2} \\ \hline & & & & \pounds 33 & 0 & 2\frac{1}{2}\ \frac{1}{2} \end{array}$$

(14)

$$\begin{array}{llll} \pounds & s. & d. & & \pounds & s. & d. \\ 2 & 10 & 3\frac{3}{4} & \times\ 26 = & 65 & 8 & 1\frac{1}{2} \\ 2 & 10 & 3\frac{3}{4} & \times\ \frac{3}{4} = & 1 & 17 & 8\frac{3}{4}\ \frac{1}{4} \\ \hline & & & & \pounds 67 & 5 & 10\frac{1}{4}\ \frac{1}{4} \end{array}$$

(15)

$$\begin{array}{ll} \text{qr.} & \text{lb.} & \text{cwt.} & \text{cwt.} \\ 2 & 7 = & \frac{63}{112} = & \frac{9}{16} \end{array}$$

$$\begin{array}{llll} \pounds & s. & d. & & \pounds & s. & d. \\ 3 & 7 & 3\frac{1}{4} & \times\ 4 = & 13 & 9 & 1 \\ 3 & 7 & 3\frac{1}{4} & \times\ \frac{9}{16} = & 1 & 17 & 10\frac{0}{4}\ \frac{5}{16} \\ \hline & & & & \pounds 15 & 6 & 11\frac{0}{4}\ \frac{5}{16} \end{array}$$

DIVISION OF VULGAR FRACTIONS.

Page 95.

(13)

$$\begin{array}{llll} \text{lb.} & \text{lb.} & \pounds & \pounds \\ 13\frac{3}{4} = & \frac{55}{4}, & 6\frac{7}{9} = & \frac{61}{9} \end{array}$$

$$\therefore \frac{61}{9} \times \overset{\pounds}{\frac{4}{55}} = \overset{\pounds}{\frac{244}{495}} = \overset{s.}{9}\ \overset{d.}{10\frac{1}{4}}\ \frac{7}{33}$$

(14)

$$\overset{\text{gal.}}{27\frac{3}{4}} = \overset{\text{gal.}}{\frac{111}{4}}$$

$$\therefore \begin{array}{lll} \pounds & s. & d. \\ 30 & 16 & 11 \end{array} \times \frac{4}{111} = \begin{array}{lll} \pounds & s. & d. \\ 1 & 2 & 2\frac{1}{4}\ \frac{41}{111} \end{array}$$

(15) $\overset{\pounds}{27\frac{11}{19}} = \overset{\pounds}{\frac{524}{19}}$:

12 men × 1 = 12 shares.

13 boys × $\frac{1}{3}$ = $4\frac{1}{3}$ ...

$16\frac{1}{3} = \frac{49}{3}$

$$\therefore \overset{\pounds}{\frac{524}{19}} \times \frac{3}{49} = \overset{\pounds}{\frac{1572}{931}} = \overset{\pounds}{1}\ \overset{s.}{13}\ \overset{d.}{9\frac{0}{4}}\ \frac{900}{931}$$ man's share.

$0\ 11\ 3\frac{0}{4}\ \frac{900}{931}$ boy's share.

(16) $\overset{s.}{8\frac{12}{13}} = \overset{s.}{\frac{116}{13}} \quad \therefore \quad \frac{116}{13 \times 5} = \overset{s.}{\frac{116}{65}} = \overset{s.}{1}\ \overset{d.}{9\frac{1}{4}}\ \frac{43}{65}$

EXERCISES ON VULGAR FRACTIONS.

Page 95.

(1)
$$\frac{5}{12} = \frac{25}{60}$$
$$\frac{4}{15} = \frac{16}{60}$$
$$\frac{3}{20} = \frac{9}{60}$$
$$\frac{50}{60} = \frac{5}{6}$$

(2)
$$9\frac{3}{7}$$
$$7$$
$$\frac{66}{7}$$

(3) $\overset{\pounds}{3}\ \overset{s.}{11}\ \overset{d.}{3} = \overset{f.}{3420}$ and $\overset{\pounds}{1}\ \overset{s.}{19}\ \overset{d.}{6\frac{1}{4}} = \overset{f.}{1897}$

$\therefore$ the part required $= \frac{1897}{3420}$

(4) $\frac{1}{2} + \frac{1}{3} + \frac{1}{7} = \frac{41}{42} \therefore 1 - \frac{41}{42} = \frac{1}{42}$ = D's part.

(5) $\overset{yd.}{15\frac{2}{5}} = \overset{yd.}{\frac{77}{5}}$ and $\overset{\pounds}{10\frac{3}{7}} = \overset{\pounds}{\frac{73}{7}}$

$$\therefore \text{price of 1 yard} = \frac{73}{7} \times \frac{5}{77} = \overset{\pounds}{\frac{365}{539}} = \overset{s.}{13}\ \overset{d.}{6\frac{1}{2}}\ \frac{50}{539}$$

(6) The cask contained $\overset{\text{gal.}}{20}$

$$\frac{1}{2} \text{ of } \frac{2}{11} \text{ of } \frac{241}{7} = \underline{3\tfrac{10}{77}}$$

$$16\tfrac{67}{77}$$

(7) $$\overset{s.}{\frac{11}{15}} \times \frac{3}{5} = \overset{s.}{\frac{11}{25}} = \overset{d.}{5\tfrac{1}{4}\ \tfrac{3}{25}}$$

(8) $$\frac{48000}{1} \times \frac{3}{16} = \overset{£}{9000}$$

(10) $$\frac{4}{9} \times \frac{5}{3} = \frac{20}{27}$$

(11) Sixteen and a fourth $= 16\tfrac{1}{4}$

Sixteen fourths $= \frac{16}{4} = \underline{4}$

$12\tfrac{1}{4}$

(12) $\frac{1}{2} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$ ∴ $1 - \frac{2}{3} = \frac{1}{3}$, what he kept to himself.

(13) $\frac{2}{5}$ of the sum $=$ £160 ∴ $\frac{1}{5}$ of the sum $= 80$; hence the whole sum, $\frac{5}{5} =$ £400.

(14) Since the man can accomplish the work in 4 days, in one day he will accomplish $\frac{1}{4}$ of it; and for a like reason the boy will accomplish $\frac{1}{9}$ of it in one day; ∴ $\frac{1}{4} + \frac{1}{9} = \frac{13}{36} =$ part that they will accomplish in one day when working together; ∴ $\frac{13 \times 2}{36} = \frac{13}{18} =$ part they accomplish in two days.

(15) $$\overset{£}{\frac{17}{18}} \times \frac{5}{8} = \overset{£}{\frac{85}{144}} = \overset{s.}{11}\quad \overset{d.}{9\tfrac{1}{2}\ \tfrac{2}{3}}$$

(16) $$\overset{£}{276\tfrac{5}{9}} = \frac{2489}{9}, \text{ and } 12\tfrac{5}{12} = \frac{149}{12}$$

$$\therefore \frac{2489}{9} \times \frac{12}{149} = \frac{2489 \times 4}{3 \times 149} = \overset{£}{\frac{9956}{447}} = \overset{£}{22}\quad \overset{s.}{5}\quad \overset{d.}{5\tfrac{1}{2}\ \tfrac{2}{149}}$$

(17) $\frac{2}{3} \times \frac{6}{7} = \frac{2 \times 2}{7} = \frac{4}{7}$ of the mine is valued at £453 0s.

			£	s.
$\frac{4}{7}$ of the mine is valued at			453	0
$\frac{1}{7}$	...	...	113	5
$\frac{7}{7}$	...	...	792	15

(18) $\frac{2}{3} \times \frac{1}{4} = \frac{1}{6}$, and $\frac{6}{7} \times \frac{11}{12} = \frac{11}{14}$

$\frac{1}{6} + \frac{11}{14} = \frac{40}{42} = \frac{20}{21} \therefore 1 - \frac{20}{21} = \frac{1}{21}$

(19) $\overset{\text{lb.}}{17\tfrac{3}{4}} = \overset{\text{lb.}}{\frac{71}{4}}$, and $\overset{£}{2\tfrac{53}{60}} = \overset{£}{\frac{173}{60}}$

$\therefore \frac{173}{60} \times \frac{4}{71} = \overset{£}{\frac{173}{15 \times 71}} = \overset{£}{\frac{173}{1065}} = 3\text{s. } 2\tfrac{3}{4}\tfrac{67}{71}\text{d.}$

(20) $\frac{\overset{\text{lb.}}{3}}{11.28.4} = \frac{\overset{\text{cwt.}}{3}}{1232}$

(21) £1 2s. $11\tfrac{1}{2}$d. $\times 27\tfrac{3}{5}$ = £31 13s. $7\tfrac{3}{4}\tfrac{1}{5}$d.

(22) $549 \times \frac{7}{9} = 427$

(23)

		£	s.	d.
$2\tfrac{3}{11}$ £.	=	2	5	$5\tfrac{1}{4}\tfrac{9}{11}$
$5\tfrac{3}{7}$ gu.	=	5	14	0
$4\tfrac{5}{7}$ s.	=	0	4	$8\tfrac{1}{2}\tfrac{2}{7}$
$11\tfrac{3}{8}$ d.	=	0	0	$11\tfrac{1}{4}\tfrac{1}{2}$
		£8	5	$1\tfrac{1}{4}\tfrac{93}{154}$

(24)

	£	s.	d.	
Value of the estate, .	7200	0	0	
$\frac{3}{5}$ of £7200, . .	4320	0	0	= son's share.
Remainder,	2880	0	0	
$\frac{2}{7}$ of £2880, . .	822	17	$1\tfrac{1}{2}\tfrac{6}{7}$	= daughter's do.
	£2057	2	$10\tfrac{1}{4}\tfrac{1}{7}$	= widow's do.

(25) $\frac{12}{19} + \frac{3}{17} = \frac{261}{323}, \frac{12}{19} - \frac{3}{17} = \frac{147}{323}, \frac{12}{19} \times \frac{3}{17} = \frac{36}{323}$

$\therefore \frac{261}{323} + \frac{147}{323} + \frac{36}{323} = \frac{444}{323} = 1\tfrac{121}{323}$

(26) $12\tfrac{60}{120} + 29\tfrac{75}{120} + 17\tfrac{88}{120} + 36\tfrac{116}{120} + 302\tfrac{24}{120} = 399\tfrac{5}{6}$

(27)

	ac.		ac.	ro.	po.
	$2\frac{5}{8}$	=	2	2	20
	$3\frac{1}{2}$	=	3	2	0
	$1\frac{7}{12}$	=	1	2	$13\frac{1}{3}$
	$5\frac{3}{32}$	=	5	0	15
			12	3	$8\frac{1}{3}$

(28) £ 60 s. 11 d. 4 $\times \frac{8}{125} =$ £ 3 s. 17 d. $6\frac{1}{4}\ \frac{27}{125}$

(29)

yd.		s.	d.			£	s.	d.		
$17\frac{5}{8}$	at	1	$3\frac{1}{2}$	per yard,	=	1	2	$9\frac{0}{4}\ \frac{3}{4}$	=	$\frac{89775}{119700}$
$12\frac{3}{7}$	at	2	$1\frac{3}{4}$	...	=	1	6	$8\frac{0}{4}\ \frac{1}{7}$	=	$\frac{17100}{119700}$
$26\frac{5}{9}$	at	1	$11\frac{1}{2}$	...	=	2	12	$0\frac{0}{4}\ \frac{2}{9}$	=	$\frac{26600}{119700}$
$16\frac{1}{2}$	at	2	9	...	=	2	5	$4\frac{1}{2}$		
$31\frac{3}{4}$	at	4	$5\frac{1}{2}$	...	=	7	1	$6\frac{1}{2}\ \frac{1}{2}$	=	$\frac{59850}{119700}$
$49\frac{3}{17}$	at	4	$11\frac{1}{2}$	...	=	12	3	10		
$35\frac{7}{19}$	at	7	$5\frac{1}{2}$	...	=	13	3	$9\frac{1}{4}\ \frac{17}{19}$	=	$\frac{107100}{119700}$
$10\frac{9}{25}$	at	10	3	...	=	5	6	$2\frac{1}{4}\ \frac{3}{25}$	=	$\frac{14364}{119700}$
$17\frac{1}{2}$	at	0	$11\frac{3}{4}$	...	=	0	17	$1\frac{1}{2}\ \frac{1}{2}$	=	$\frac{59850}{119700}$
						£45	19	$3\frac{3}{4}\ \frac{15539}{119700}$		$\frac{374639}{119700}$

(30) $75\frac{1}{2}$ miles $= \overset{\text{miles.}}{\frac{151}{2}} = \frac{151 \times 5280}{2}$ feet; $16\frac{1}{2} = \frac{33}{2}$

$$\therefore \frac{151 \times 5280}{2} \times \frac{2}{33} = 151 \times 160 = 24160$$

PRACTICE.

Page 107.

(109)

			£	s.	d.		£	s.	d.
	327	at	1	2	$7\frac{1}{2}$	=	369	18	$4\frac{1}{2}$
	$\frac{1}{2}$	at	1	2	$7\frac{1}{2}$	=	0	11	$3\frac{3}{4}$
∴	$327\frac{1}{2}$ cost	.				=	£370	9	$8\frac{1}{4}$

(110)

			s.	d.		£	s.	d.
	416	at	7	$5\frac{3}{4}$	=	155	11	4
	$\frac{2}{3}$	at	7	$5\frac{3}{4}$	=	0	4	$11\frac{3}{4}\ \frac{1}{3}$
∴	$416\frac{2}{3}$ cost	.			=	£155	16	$3\frac{3}{4}\ \frac{1}{3}$

(111)

			£	s.	d.		£	s.	d.
	756	at	3	18	6	=	2967	6	0
	$\frac{5}{6}$	at	3	18	6	=	3	5	5
∴	$756\frac{5}{6}$ cost	.				=	£2970	11	5

(112)

		£	s.	d.		£	s.	d.
1234	at	1	11	$11\frac{1}{4}$	=	1970	10	$10\frac{1}{2}$
$\frac{3}{8}$	at	1	11	$11\frac{1}{4}$	=	0	11	$11\frac{1}{2}\,\frac{7}{8}$
∴ $1234\frac{3}{8}$ cost			.		=	£1971	2	$10\frac{0}{4}\,\frac{7}{8}$

(113)

		£	s.	d.		£	s.	d.
964	at	7	12	$5\frac{1}{2}$	=	7348	9	10
$\frac{5}{12}$	at	7	12	$5\frac{1}{2}$	=	3	3	$6\frac{1}{4}\,\frac{1}{6}$
∴ $964\frac{5}{12}$ cost			.		=	£7351	13	$4\frac{1}{4}\,\frac{1}{6}$

(114)

		s.	d.		£	s.	d.
1832	at	16	$8\frac{3}{4}$	=	1532	7	10
$\frac{5}{16}$	at	16	$8\frac{3}{4}$	=	0	5	$2\frac{1}{2}\,\frac{15}{16}$
∴ $1832\frac{5}{16}$ cost		.		=	£1532	13	$0\frac{1}{2}\,\frac{15}{16}$

(115)

		£	s.	d.		£	s.	d.
173	at	3	17	6	=	670	7	6
$\frac{4}{11}$	at	3	17	6	=	1	8	$2\frac{0}{4}\,\frac{8}{11}$
∴ $173\frac{4}{11}$ cost			.		=	£671	15	$8\frac{0}{4}\,\frac{8}{11}$

(116)

		£	s.	d.		£	s.	d.
7291	at	1	19	$9\frac{3}{4}$	=	14513	12	$11\frac{1}{4}$
$\frac{4}{9}$	at	1	19	$9\frac{3}{4}$	=	0	17	$8\frac{1}{4}\,\frac{1}{3}$
∴ $7291\frac{4}{9}$ cost			.		=	£14514	10	$7\frac{1}{2}\,\frac{1}{3}$

(117) 1 qr. 21 lb. $= \frac{49}{112}$ cwt. $= \frac{7}{16}$ cwt.

		£	s.	d.		£	s.	d.
272	at	3	2	$3\frac{3}{4}$	=	847	9	0
$\frac{7}{16}$	at	3	2	$3\frac{3}{4}$	=	1	7	$3\frac{0}{4}\,\frac{9}{16}$
∴ $272\frac{7}{16}$ cost			.		=	£848	16	$3\frac{0}{4}\,\frac{9}{16}$

(118) 2 ro. 20 po. = 100 po. $= \frac{100}{160}$ ac. $= \frac{5}{8}$ ac.

		£	s.	d.		£	s.	d.
123	at	102	13	6	=	12629	0	6
$\frac{5}{8}$	at	102	13	6	=	64	3	$5\frac{1}{4}$
∴ $123\frac{5}{8}$ cost			.		=	£12693	3	$11\frac{1}{4}$

(119) 5 bush. = $\frac{5}{8}$ qr.

		£	s.	d.		£	s.	d.
239	at	1	13	7	=	401	6	5
⅝	at	1	13	7	=	1	0	11¾ ½
∴ 239⅝ cost	.				=	£402	7	4¾ ½

(120) 3 qr. 14 lb. = 98 lb. = $\frac{98}{112}$ cwt. = $\frac{7}{8}$ cwt.

		£	s.	d.		£	s.	d.
213	at	4	7	11½	=	936	15	1½
⅞	at	4	7	11½	=	3	16	11½ ¼
∴ 213⅞ cost	. . .				=	£940	12	1 0/4 ¼

(121)

		s.	d.		£	s.	d.
723	at	3	2½	=	115	19	7½
11/12	at	3	2½	=	0	2	11¼ ⅙
∴ 723 11/12 cost	. . .			=	£116	2	6¾ ⅙

(122)

			£	s.	d.
27 cwt. at £2, 3s. 7¼d. per cwt.		=	58	17	3¾
1 qr.	do.	=	0	10	10¾ ¼
14 lb.	do.	=	0	5	5¼ ⅝
∴ 27 cwt. 1 qr. 14 lb. cost		=	£59	13	7¾ ⅞

(123)

			£	s.	d.
39 cwt. at £5, 6s. 1d. per cwt.		=	206	17	3
2 qr.	do.	=	2	13	0½
8 lb.	do.	=	0	7	6¾ 5/7
∴ 39 cwt. 2 qr. 8 lb. cost	.	=	£209	17	10¼ 5/7

(124)

			£	s.	d.
135 cwt. at 17s. 3¾d. per cwt.		=	116	17	2¼
2 qr.	do.	=	0	8	7¾ ½
1 qr.	do.	=	0	4	3¾ ¾
4 lb.	do.	=	0	0	7¼ 19/28
∴ 135 cwt. 3 qr. 4 lb. cost	.	=	£117	10	9¼ 13/14

(125)

			£	s.	d.
79 cwt. at £7, 15s. 10½d. per cwt.		=	615	14	1½
2 qr.	do.	=	3	17	11¼
1 qr.	do.	=	1	18	11½ ½
14 lb.	do.	=	0	19	5¾ ¼
7 lb.	do.	=	0	9	8¾ ⅝
∴ 79 cwt. 3 qr. 21 lb. cost	.	=	£623	0	3 0/4 ⅜

		£	s.	d.
(126) 85 cwt. at £1, 13s. 4d. per cwt.	=	141	13	4
16 lb. do.	=	0	4	$9\frac{0}{4}\ \frac{4}{7}$
8 lb. do.	=	0	2	$4\frac{1}{2}\ \frac{2}{7}$
∴ 85 cwt. 24 lb. cost .	=	£142	0	$5\frac{1}{2}\ \frac{6}{7}$

		£	s.	d.
(127) 23 cwt. at 12s. 11¼d. per cwt.	=	14	17	$6\frac{3}{4}$
2 qr. do.	=	0	6	$5\frac{1}{2}\ \frac{1}{2}$
7 lb. do.	=	0	0	$9\frac{1}{2}\ \frac{13}{16}$
∴ 23 cwt. 2 qr. 7 lb. cost .	=	£15	4	$10\frac{0}{4}\ \frac{5}{16}$

		£	s.	d.
(128) 742 cwt. at £3, 19s. 4d. per cwt.	=	2943	5	4
1 qr. do.	=	0	19	10
14 lb. do.	=	0	9	11
7 lb. do.	=	0	4	$11\frac{1}{2}$
2 lb. do.	=	0	1	5
∴ 742 cwt. 1 qr. 23 lb. cost .	=	£2945	1	$5\frac{1}{2}$

		£	s.	d.
(129) 51 ac. at £26, 17s. 1½d. per ac.	=	1369	13	$4\frac{1}{2}$
2 ro. do.	=	13	8	$6\frac{3}{4}$
20 po. do.	=	3	7	$1\frac{1}{2}\ \frac{3}{4}$
10 po. do.	=	1	13	$6\frac{3}{4}\ \frac{3}{8}$
∴ 51 ac. 2 ro. 30 po. cost .	=	£1388	2	$7\frac{3}{4}\ \frac{1}{8}$

		£	s.	d.
(130) 12 ac. at £103, 13s. 11d. per ac.	=	1244	7	0
2 ro. do.	=	51	16	$11\frac{1}{2}$
1 ro. do.	=	25	18	$5\frac{3}{4}$
20 po. do.	=	12	19	$2\frac{3}{4}\ \frac{1}{2}$
5 po. do.	=	3	4	$9\frac{1}{2}\ \frac{7}{8}$
∴ 12 ac. 3 ro. 25 po. cost .	=	£1338	6	$5\frac{3}{4}\ \frac{3}{8}$

		£	s.	d.
(131) 96 ac. at £17, 2s. 10¼d. per ac.	=	1645	14	0
1 ro. do.	=	4	5	$8\frac{1}{2}\ \frac{1}{4}$
10 po. do.	=	1	1	$5\frac{0}{4}\ \frac{9}{16}$
∴ 96 ac. 1 ro. 10 po. cost .	=	£1651	1	$1\frac{1}{2}\ \frac{13}{16}$

(119) 5 bush. $= \frac{5}{8}$ qr.

		£	s.	d.		£	s.	d.
239	at	1	13	7	=	401	6	5
⅝	at	1	13	7	=	1	0	11¾ ½
∴ 239⅝ cost	.				=	£402	7	4¾ ½

(120) 3 qr. 14 lb. = 98 lb. $= \frac{98}{112}$ cwt. $= \frac{7}{8}$ cwt.

		£	s.	d.		£	s.	d.
213	at	4	7	11½	=	936	15	1½
⅞	at	4	7	11½	=	3	16	11½ ¼
∴ 213⅞ cost	. . .				=	£940	12	1⁰⁄₄ ¼

(121)

		s.	d.		£	s.	d.
723	at	3	2½	=	115	19	7½
¹¹⁄₁₂	at	3	2½	=	0	2	11¼ ⅙
∴ 723¹¹⁄₁₂ cost	. . .			=	£116	2	6¾ ⅙

(122)

			£	s.	d.
27 cwt. at £2, 3s. 7¼d. per cwt.		=	58	17	3¾
1 qr.	do.	=	0	10	10¾ ¼
14 lb.	do.	=	0	5	5¼ ⅝
∴ 27 cwt. 1 qr. 14 lb. cost		=	£59	13	7¾ ⅞

(123)

			£	s.	d.
39 cwt. at £5, 6s. 1d. per cwt.		=	206	17	3
2 qr.	do.	=	2	13	0½
8 lb.	do.	=	0	7	6¾ ⁵⁄₇
∴ 39 cwt. 2 qr. 8 lb. cost .		=	£209	17	10¼ ⁵⁄₇

(124)

			£	s.	d.
135 cwt. at 17s. 3¾d. per cwt.		=	116	17	2¼
2 qr.	do.	=	0	8	7¾ ½
1 qr.	do.	=	0	4	3¾ ¾
4 lb.	do.	=	0	0	7¼ ¹⁹⁄₂₈
∴ 135 cwt. 3 qr. 4 lb. cost .		=	£117	10	9¼ ¹³⁄₁₄

(125)

			£	s.	d.
79 cwt. at £7, 15s. 10½d. per cwt.		=	615	14	1½
2 qr.	do.	=	3	17	11¼
1 qr.	do.	=	1	18	11½ ½
14 lb.	do.	=	0	19	5¾ ¼
7 lb.	do.	=	0	9	8¾ ⅝
∴ 79 cwt. 3 qr. 21 lb. cost .		=	£623	0	3⁰⁄₄ ⅜

			£	s.	d.
(126)	**85 cwt. at £1, 13s. 4d. per cwt.**	=	141	13	4
	16 lb. do.	=	0	4	9⁰⁄₄ ⁴⁄₇
	8 lb. do.	=	0	2	4½ ²⁄₇
	∴ 85 cwt. 24 lb. cost .	=	£142	0	5½ ⁶⁄₇

			£	s.	d.
(127)	**23 cwt. at 12s. 11¼d. per cwt.**	=	14	17	6¾
	2 qr. do.	=	0	6	5½ ½
	7 lb. do.	=	0	0	9½ ¹³⁄₁₆
	∴ 23 cwt. 2 qr. 7 lb. cost .	=	£15	4	10⁰⁄₄ ⁵⁄₁₆

			£	s.	d.
(128)	**742 cwt. at £3, 19s. 4d. per cwt.**	=	2943	5	4
	1 qr. do.	=	0	19	10
	14 lb. do.	=	0	9	11
	7 lb. do.	=	0	4	11½
	2 lb. do.	=	0	1	5
	∴ 742 cwt. 1 qr. 23 lb. cost .	=	£2945	1	5½

			£	s.	d.
(129)	**51 ac. at £26, 17s. 1½d. per ac.**	=	1369	13	4½
	2 ro. do.	=	13	8	6¾
	20 po. do.	=	3	7	1½ ¾
	10 po. do.	=	1	13	6¾ ⅜
	∴ 51 ac. 2 ro. 30 po. cost .	=	£1388	2	7¾ ⅛

			£	s.	d.
(130)	**12 ac. at £103, 13s. 11d. per ac.**	=	1244	7	0
	2 ro. do.	=	51	16	11½
	1 ro. do.	=	25	18	5¾
	20 po. do.	=	12	19	2¾ ½
	5 po. do.	=	3	4	9½ ⅞
	∴ 12 ac. 3 ro. 25 po. cost .	=	£1338	6	5¾ ⅜

			£	s.	d.
(131)	**96 ac. at £17, 2s. 10½d. per ac.**	=	1645	14	0
	1 ro. do.	=	4	5	8½ ¼
	10 po. do.	=	1	1	5⁰⁄₄ ⁹⁄₁₆
	∴ 96 ac. 1 ro. 10 po. cost .	=	£1651	1	1½ ¹³⁄₁₆

(132)

$$\begin{array}{lcrrl}
 & & \pounds & s. & d. \\
\text{82 ac. at £12, 14}s.\ 6d.\text{ per ac.} & = & 1043 & 9 & 0 \\
\text{10 po.}\quad ״\quad ״\quad ״ & = & 0 & 15 & 10\frac{3}{4}\ \frac{1}{2} \\
\text{5}\ ״\quad ״\quad ״\quad ״ & = & 0 & 7 & 11\frac{1}{4}\ \frac{3}{4} \\
\hline
\therefore\ \text{82 ac. 15 po. cost} & = & \pounds1044 & 12 & 10\frac{1}{4}\ \frac{1}{4}
\end{array}$$

(133)

$$\begin{array}{rr}
s. & d. \\
525 & 7 \\
 & 7\frac{1}{2} \\
\hline
262 & 9\frac{1}{2} \\
3679 & 1 \\
\hline
2,0)394,1 & 10\frac{1}{2} \\
\hline
\pounds197\ \ 1 & 10\frac{1}{2}
\end{array}$$

(134)

$$\begin{array}{lrl}
 & s. & d. \\
 & 432 & 11 \\
 & & 2 \\
\hline
d. & 865 & 10 \\
3 = \frac{1}{4}\text{ of 1s.} & 108 & 2\frac{3}{4} \\
\frac{1}{2} = \frac{1}{6}\text{ of 3d.} & 18 & 0\frac{1}{4}\ \frac{5}{6} \\
\hline
 & 2,0)99,2 & 1\frac{0}{4}\ \frac{5}{6} \\
\hline
 & \pounds49\ \ 12 & 1\frac{0}{4}\ \frac{5}{6}
\end{array}$$

(135)

$$\begin{array}{lrl}
 & s. & d. \\
 & 745 & 10\frac{1}{2} \\
 & & 4 \\
\hline
d. & 2983 & 6 \\
6 = \frac{1}{2} & 372 & 11\frac{1}{4} \\
3 = \frac{1}{2} & 186 & 5\frac{1}{2}\ \frac{1}{2} \\
\frac{1}{2} = \frac{1}{6} & 31 & 0\frac{3}{4}\ \frac{3}{4} \\
\hline
 & 2,0)357,3 & 11\frac{3}{4}\ \frac{1}{4} \\
\hline
 & \pounds178\ \ 13 & 11\frac{3}{4}\ \frac{1}{4}
\end{array}$$

(136)

$$\begin{array}{lrl}
 & s. & d. \\
 & 65 & 3\frac{1}{4} \\
 & & 3 \\
\hline
d. & 195 & 9\frac{3}{4} \\
6 = \frac{1}{2} & 32 & 7\frac{1}{2}\ \frac{1}{2} \\
1\frac{1}{2} = \frac{1}{4} & 8 & 1\frac{3}{4}\ \frac{5}{8} \\
\frac{1}{4} = \frac{1}{6} & 1 & 4\frac{1}{4}\ \frac{13}{48} \\
\hline
 & 2,0)23,7 & 11\frac{1}{2}\ \frac{19}{48} \\
\hline
 & \pounds11\ \ 17 & 11\frac{1}{2}\ \frac{19}{48}
\end{array}$$

SIMPLE PROPORTION.

Page 124.

(13)

$$17 : 85 :: \overset{\pounds}{1}\ \overset{s.}{9}\ \overset{d.}{7\frac{1}{2}}$$

$$\frac{\overset{\pounds}{1}\ \overset{s.}{9}\ \overset{d.}{7\frac{1}{2}} \times 85}{17} = \overset{\pounds}{1}\ \overset{s.}{9}\ \overset{d.}{7\frac{1}{2}} \times 5 = \overset{\pounds}{7}\ \overset{s.}{8}\ \overset{d.}{1\frac{1}{2}}$$

(14)

$$\overset{yd.}{37}\ \overset{qr.}{2} = \overset{qr.}{150};\ \overset{\pounds}{4}\ \overset{s.}{17}\ \overset{d.}{3} = \overset{d.}{1167}$$

$$98 = 392$$

$$150 : 392 :: \overset{d.}{1167}$$

$$\frac{392 \times 1167}{150} = \frac{196 \times 389}{25} = \frac{\overset{d.}{76244}}{25} = \overset{d.}{3049\frac{3}{4}}\ \frac{1}{25} = \overset{\pounds}{12}\ \overset{s.}{14}\ \overset{d.}{1\frac{3}{4}}\ \frac{1}{25}$$

(15)

$$\overset{cwt.}{6}\ \overset{qr.}{1}\ \overset{lb.}{6} = \overset{lb.}{706};\ \overset{\pounds}{7}\ \overset{s.}{15} = \overset{s.}{155}$$

$$31 : 706 :: \overset{s.}{155}$$

$$\frac{706 \times 155}{31} = 706 \times 5 = \overset{s.}{3530} = \overset{\pounds}{176}\ \overset{s.}{10}$$

(16)

$$95 : 5 :: \overset{£}{106}\ \overset{s.}{18}\ \overset{d.}{5\tfrac{1}{4}}$$

$$\frac{\overset{£}{106}\ \overset{s.}{18}\ \overset{d.}{5\tfrac{1}{4}} \times 5}{95} = \frac{\overset{£}{106}\ \overset{s.}{18}\ \overset{d.}{5\tfrac{1}{4}}}{19} = \overset{£}{5}\ \overset{s.}{12}\ \overset{d.}{6\tfrac{1}{2}}\ \tfrac{7}{19}$$

(17)

$$\overset{£}{34}\ \overset{s.}{10}\ \overset{d.}{3\tfrac{3}{4}} = \overset{f.}{33135}$$

$$47 : 117 :: \overset{f.}{33135}$$

$$\frac{117 \times 33135}{47} = \frac{3876795}{47} = \overset{f.}{82485} = \overset{£}{85}\ \overset{s.}{18}\ \overset{d.}{5\tfrac{1}{4}}$$

(18)

$$\overset{£}{287}\ \overset{s.}{2}\ \overset{d.}{6\tfrac{3}{4}} = \overset{f.}{275643}$$

$$41 : 33 :: \overset{f.}{275643}$$

$$\frac{33 \times 275643}{41} = \frac{9096219}{41} = \overset{f.}{221859} = \overset{£}{231}\ \overset{s.}{2}\ \overset{d.}{0\tfrac{3}{4}}$$

(19)

$$\overset{£}{45}\ \overset{s.}{11}\ \overset{d.}{3} = \overset{d.}{10935};\ \overset{cwt.}{6}\ \overset{qr.}{1}\ \overset{lb.}{12} = \overset{lb.}{712}$$

$$18\ 4\ 6 = 4374$$

$$4374 : 10935 :: \overset{lb.}{712}$$

$$\frac{10935 \times 712}{4374} = 356 \times 5 = \overset{lb.}{1780} = \overset{cwt.}{15}\ \overset{qr.}{3}\ \overset{lb.}{16}$$

(20)

$$\overset{£}{0}\ \overset{s.}{3}\ \overset{d.}{7\tfrac{1}{2}} = \overset{f.}{174}$$

$$21\ 4\ 1\tfrac{1}{2} = 20358$$

$$\therefore\ 174 : 20358 :: \overset{lb.}{14}$$

$$\frac{20358 \times 14}{174} = \frac{3393 \times 14}{29} = \frac{47502}{29} = \overset{lb.}{1638} = \overset{cwt.}{14}\ \overset{qr.}{2}\ \overset{lb.}{14}$$

(21)

$$3 \times 57 = 171;\ \overset{£}{72}\ \overset{s.}{3}\ \overset{d.}{4\tfrac{1}{4}} = \overset{f.}{69281}$$

$$76 : 171 :: \overset{f.}{69281}$$

$$\frac{171 \times 69281}{76} = \frac{11847051}{76} = \overset{f.}{155882\tfrac{1}{4}} = \overset{£}{162}\ \overset{s.}{7}\ \overset{d.}{6\tfrac{1}{2}}\ \tfrac{1}{4}$$

(22)
$$37 \times 5 = 185;\ \overset{\pounds}{4}\ \overset{s.}{13}\ \overset{d.}{9\tfrac{3}{4}} = \overset{f.}{4503}$$

$$17 : 185 :: \overset{f.}{4503}$$

$$\frac{185 \times 4503}{17} = \frac{\overset{f.}{833055}}{17} = \overset{f.}{49003\tfrac{4}{17}} = \overset{\pounds}{51}\ \overset{s.}{0}\ \overset{d.}{10\tfrac{3}{4}}\ \tfrac{4}{17}$$

(23)
$$\overset{yd.}{41}\ \overset{qr.}{2} = \overset{qr.}{166};\ \overset{\pounds}{22}\ \overset{s.}{17}\ \overset{d.}{6} = \overset{d.}{5490};\ \overset{\text{Eng. ell.}}{25} = \overset{qr.}{125}$$

$$125 : 166 :: \overset{d.}{5490}$$

$$\frac{166 \times 5490}{125} = \frac{166 \times 1098}{25} = \frac{\overset{d.}{182268}}{25} = \overset{d.}{7290\tfrac{1}{2}}\ \tfrac{22}{25} = \overset{\pounds}{30}\ \overset{s.}{7}\ \overset{d.}{6\tfrac{1}{2}}\ \tfrac{22}{25}$$

(24)
$$\overset{ac.}{82}\ \overset{ro.}{3}\ \overset{po.}{20} = \overset{po.}{13260};\ \overset{\pounds}{241}\ \overset{s.}{17}\ \overset{d.}{2\tfrac{1}{2}} = \overset{f.}{232186}$$
$$10\ \ 1\ \ 0 = 1640$$

$$13260 : 1640 :: \overset{f.}{232186}$$

$$\frac{1640 \times 232186}{13260} = \frac{82 \times 232186}{663} = \frac{19039252}{663} = \overset{f.}{28716\tfrac{544}{663}} =$$
$$\overset{\pounds}{29}\ \overset{s.}{18}\ \overset{d.}{3\tfrac{0}{4}}\ \tfrac{544}{663}$$

(25)
$$\overset{cwt.}{56}\ \overset{qr.}{3}\ \overset{lb.}{14} = \overset{lb.}{6370};\ \overset{s.}{15}\ \overset{d.}{4\tfrac{1}{2}} = \overset{f.}{738}$$

$$18 : 6370 :: \overset{f.}{738}$$

$$\frac{6370 \times 738}{18} = 6370 \times 41 = \overset{f.}{261170} = \overset{\pounds}{272}\ \overset{s.}{1}\ \overset{d.}{0\tfrac{1}{2}}$$

(26)
$$21 : 126 :: \overset{\pounds}{19}\ \overset{s.}{5}\ \overset{d.}{3\tfrac{3}{4}}$$

$$\frac{\overset{\pounds}{19}\ \overset{s.}{5}\ \overset{d.}{3\tfrac{3}{4}} \times 126}{21} = \overset{\pounds}{19}\ \overset{s.}{5}\ \overset{d.}{3\tfrac{3}{4}} \times 6 = \overset{\pounds}{115}\ \overset{s.}{11}\ \overset{d.}{10\tfrac{1}{2}}$$

(27)
$$\overset{cwt.}{7}\ \overset{qr.}{3}\ \overset{lb.}{18} = \overset{lb.}{886};\ \overset{s.}{4}\ \overset{d.}{4\tfrac{1}{2}} = \overset{f.}{210}$$

$$11 : 886 :: \overset{f.}{210}$$

$$\frac{886 \times 210}{11} = \frac{186060}{11} = \overset{f.}{16914\tfrac{6}{11}} = \overset{\pounds}{17}\ \overset{s.}{12}\ \overset{d.}{4\tfrac{1}{2}}\ \tfrac{6}{11}$$

(28) $\overset{\text{cwt.}}{15}\ \overset{\text{lb.}}{27} = \overset{\text{lb.}}{1707}\,;\ \overset{£}{3}\ \overset{s.}{7}\ \overset{d.}{4\frac{1}{2}} = \overset{f.}{3234}$

$$7 : 1707 :: \overset{f.}{3234}$$

$$\frac{1707 \times 3234}{7} = 1707 \times 462 = \overset{f.}{788634} = \overset{£}{821}\ \overset{s.}{9}\ \overset{d.}{10\frac{1}{2}}$$

(29) $\overset{\text{cwt.}}{3}\ \overset{\text{lb.}}{16} = \overset{\text{lb.}}{352}\,;\ \overset{s.}{7}\ \overset{d.}{1} = \overset{d.}{85}$

$$17 : 352 :: \overset{d.}{85}$$

$$\frac{352 \times 85}{17} = 352 \times 5 = \overset{d.}{1760} = \overset{£}{7}\ \overset{s.}{6}\ \overset{d.}{8}$$

(30) $7 : 28 :: \overset{\text{men.}}{18}$

$$\frac{28 \times 18}{7} = 4 \times 18 = \overset{\text{men.}}{72}$$

(31) $\overset{£}{3}\ \overset{s.}{18} = \overset{s.}{78}$

$$65 : 365 :: \overset{s.}{78}$$

$$\frac{365 \times 78}{65} = 73 \times 6 = \overset{s.}{438} = \overset{£}{21}\ \overset{s.}{18}$$

(32) $\overset{\text{bush.}}{7} = \overset{\text{pk.}}{28}$

$$28 : 3 :: \overset{\text{lb.}}{448}$$

$$\frac{3 \times 448}{28} = 3 \times 16 = \overset{\text{lb.}}{48}$$

(33) $\overset{£}{10}\ \overset{s.}{4}\ \overset{d.}{9} = \overset{d.}{2457}$

$$7 : 2457 :: \overset{£}{1}$$

$$\frac{2457}{7} = \overset{£}{351}$$

(34) $\overset{£}{76}\ \overset{s.}{10}\ \overset{d.}{7\frac{1}{2}} = \overset{f.}{73470}$

$$420 : 25 :: \overset{f.}{73470}$$

$$\frac{25 \times 73470}{420} = \frac{5 \times 12245}{14} = \frac{\overset{f.}{61225}}{14} = \overset{f.}{4373\tfrac{3}{14}} = \overset{£}{4}\ \overset{s.}{11}\ \overset{d.}{1\frac{1}{4}}\ \tfrac{3}{14}$$

(35) $12 : 9 :: \overset{\text{days.}}{6}$

$$\frac{9 \times 6}{12} = \frac{9}{2} = \overset{\text{days.}}{4\frac{1}{2}}$$

(36) $20 : 15 :: \overset{\text{lb.}}{20}$

$$\frac{15 \times 20}{20} = \overset{\text{lb.}}{15}$$

(37) $42 : 32 :: \overset{\text{bar.}}{21}$

$$\frac{32 \times 21}{42} = \overset{\text{bar.}}{16}$$

(38) $\overset{\text{hr.}}{2}\ \overset{\text{min.}}{10} = \overset{\text{min.}}{130}$

$4\ \ 0 = 240$

$130 : 240 :: \overset{\text{miles.}}{7}$

$$\frac{240 \times 7}{130} = \frac{24 \times 7}{13} = \frac{168}{13} = \overset{\text{miles.}}{12\tfrac{12}{13}}$$

(39) $10 : 27 :: \overset{\text{men.}}{30}$

$$\frac{27 \times 30}{10} = 27 \times 3 = \overset{\text{men.}}{81}$$

(40) $1925 : 275 :: \overset{\text{mo.}}{9}$

$$\frac{275 \times 9}{1925} = \frac{9}{7} = \overset{\text{mo.}}{1}\ \overset{\text{wk.}}{1}\ \overset{\text{day.}}{1} = \overset{\text{mo}}{1\tfrac{2}{7}}$$

(41) $\overset{\text{£}}{8}\ \overset{s.}{1}\ \overset{d.}{6} = \overset{d.}{1938}$

$243\ \ 2\ \ 0 = 58344$

$1938 : 58344 :: \overset{\text{gal.}}{19}$

$$\frac{58344 \times 19}{1938} = \frac{9724 \times 19}{323} = \frac{184756}{323} = \overset{\text{gal.}}{572}$$

(42) $\overset{\text{£}}{185}\ \overset{s.}{14}\ \overset{d.}{6} = \overset{f.}{178296}$

$996\ \ 18\ \ 1\tfrac{1}{2} = 957030$

$178296 : 957030 :: \overset{\text{qr.}}{68}$

$$\frac{957030 \times 68}{178296} = \frac{159505 \times 17}{7429} = \frac{2711585}{7429} = \overset{\text{qr.}}{365}$$

(43) $\overset{\text{tons.}}{4}\ \overset{\text{cwt.}}{6}\ \overset{\text{qr.}}{0} = \overset{\text{qr.}}{344}$; $\overset{\text{£}}{39}\ \overset{s.}{17}\ \overset{d.}{5\tfrac{1}{4}} = \overset{f.}{38277}$

$1723\ \ 0\ \ 1 = 137841$

$344 : 137841 :: \overset{f.}{38277}$

$$\frac{137841 \times 38277}{344} = \frac{5276139957}{344} = \overset{f.}{15337616\tfrac{53}{344}} = \overset{\text{£}}{15976}\ \overset{s.}{13}\ \overset{d.}{8\tfrac{0}{4}}\ \tfrac{53}{344}$$

(44) $48 : 112 :: \overset{\text{oxen.}}{27}$

$$\frac{112 \times 27}{48} = 7 \times 9 = \overset{\text{oxen.}}{63}$$

(45) $12 : 20 :: \overset{\text{mo.}}{5}$

$$\frac{20 \times 5}{12} = \frac{5 \times 5}{3} = \overset{\text{mo.}}{\frac{25}{3}} = \overset{\text{mo.}}{8\tfrac{1}{3}}$$

(46)
£ s. d.
1750 : 1 : : 98 8 9

$$\frac{\overset{\pounds}{98}\ \overset{s.}{8}\ \overset{d.}{9}}{1750} = \overset{s.}{1}\ \overset{d.}{1\frac{1}{2}}$$

(47)
£ s. d. f.
0 3 $4\frac{1}{4}$ = 161
12 18 $3\frac{1}{2}$ = 12398

lb.
161 : 12398 : : 2

$$\frac{12398 \times 2}{161} = \frac{24796}{161} = \overset{lb.}{154\frac{2}{161}} = \overset{cwt.}{1}\ \overset{qr.}{1}\ \overset{lb.}{14\frac{2}{161}}$$

(48)
yd. qr. qr. £ s. d. d.
327 0 = 1308; 43 8 9 = 10425
237 2 = 950

d.
1308 : 950 : : 10425

$$\frac{950 \times 10425}{1308} = \frac{475 \times 3475}{218} = \frac{1650625}{218} = \overset{d.}{7571\frac{1}{2}\ \frac{76}{109}} =$$

£ s. d.
31 10 $11\frac{1}{2}\ \frac{76}{109}$

(49)
£ s. d. f.
15 7 $9\frac{1}{2}$ = 14774
210 7 0 = 201936

gal.
14774 : 201936 : : 23

$$\frac{201936 \times 23}{14774} = \frac{100968 \times 23}{7387} = \frac{2322264}{7387} = \overset{gal.}{314\frac{2746}{7387}}$$

(50)
lb. oz. oz.
3 2 = 50

oz.
56 : 50 : : 50

$$\frac{50 \times 50}{56} = \frac{25 \times 25}{14} = \frac{625}{14} = \overset{oz.}{44\frac{9}{14}} = \overset{lb.}{2}\ \overset{oz.}{12\frac{9}{14}}$$

(51)
d. f.
$8\frac{1}{2}$ = 34

f.
60 : 49 :: 34

$$\frac{49 \times 34}{60} = \frac{49 \times 17}{30} = \frac{833}{30} = \overset{f.}{27\frac{23}{30}} = \overset{d.}{6\frac{3}{4}\ \frac{23}{30}}$$

(52)
$$\begin{array}{rrrcl} \pounds & s. & d. & & f. \\ 1728 & 12 & 7\frac{1}{2} & = & 1659486 \\ 983 & 12 & 4 & = & 944272 \end{array}$$

$$1659486 \quad : \quad 944272 \quad :: \quad \overset{s.}{20}$$

$$\frac{944272 \times 20}{1659486} = \frac{\overset{s.}{9442720}}{829743} = \overset{s.}{11} \quad \overset{d.}{4\frac{1}{2}}\,\frac{70294}{276581}$$

(53)
$$\begin{array}{rrrcrcrrcr} \pounds & s. & d. & & f. & & \text{cwt.} & \text{lb.} & & \text{lb.} \\ 158 & 1 & 8\frac{1}{2} & = & 151762 & & 52 & 13 & = & 5837 \\ 82 & 7 & 2\frac{1}{2} & = & 79066 & & & & & \end{array}$$

$$151762 \quad : \quad 79066 \quad :: \quad \overset{\text{lb.}}{5837}$$

$$\frac{79066 \times 5837}{151762} = \frac{39533 \times 5837}{75881} = \frac{230754121}{75881} = \overset{\text{lb.}}{3041} = \overset{\text{cwt.}}{27}\ \overset{\text{qr.}}{0}\ \overset{\text{lb.}}{17}$$

(54) From the beginning of Jan. to Sept. 25 are 268 days.

$$\overset{\pounds}{72}\ \overset{s.}{18} = \overset{s.}{1458}$$

$$365 \quad : \quad 268 \quad :: \quad \overset{s.}{1458}$$

$$\frac{268 \times 1458}{365} = \frac{390744}{365} = \overset{s.}{1070} \quad \overset{d.}{6\frac{1}{4}}\,\frac{187}{365} = \overset{\pounds}{53}\ \overset{s.}{10}\ \overset{d.}{6\frac{1}{4}}\,\frac{187}{365}$$

(55)
$$\begin{array}{rrrcl} \text{yd.} & \text{qr.} & \text{nl.} & & \text{nl.} \\ 28 & 1 & 0 & = & 452; \\ 14 & 2 & 1 & = & 233 \\ \hline \end{array} \qquad \overset{\pounds}{10}\ \overset{s.}{15}\ \overset{d.}{4} = \overset{d.}{2584}$$

$$\text{remainder,} = 219$$

$$233 \quad : \quad 219 \quad :: \quad \overset{d.}{2584}$$

$$\frac{219 \times 2584}{233} = \frac{565896}{233} = \overset{d.}{2428\frac{1}{2}}\,\frac{222}{233} = \overset{\pounds}{10}\ \overset{s.}{2}\ \overset{d.}{4\frac{1}{2}}\,\frac{222}{233}$$

(56)
$$114 \times 56 = \dot{6}384$$

$$28 \quad : \quad 6384 \quad :: \quad \overset{\pounds}{13}\ \overset{s.}{17}\ \overset{d.}{2\frac{3}{4}}$$

$$\frac{\overset{\pounds}{13}\ \overset{s.}{17}\ \overset{d.}{2\frac{3}{4}} \times 6384}{28} = \overset{\pounds}{13}\ \overset{s.}{17}\ \overset{d.}{2\frac{3}{4}} \times 228 = \overset{\pounds}{3160}\ \overset{s.}{8}\ \overset{d.}{3}$$

(57)

$$64 : 57 :: \overset{\text{days.}}{108}$$

$$\frac{57 \times 108}{64} = \frac{57 \times 27}{16} = \frac{1539}{16} = \overset{\text{days.}}{96\tfrac{3}{16}}$$

(58)

$$5 : 6 :: \overset{\text{gal.}}{230}$$

$$\frac{6 \times 230}{5} = 6 \times 46 = \overset{\text{gal.}}{276}$$

(59)

$$\overset{\text{cwt.}}{14}\ \overset{\text{qr.}}{0}\ \overset{\text{lb.}}{23} = \overset{\text{lb.}}{1591}$$

$$37 : 65 :: \overset{\text{lb.}}{1591}$$

$$\frac{65 \times 1591}{37} = \frac{103415}{37} = \overset{\text{lb.}}{2\dot{7}95} = \overset{\text{cwt.}}{24}\ \overset{\text{qr.}}{3}\ \overset{\text{lb.}}{23}$$

COMPOUND PROPORTION.

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(1)

$$\begin{array}{l} 75 : 108 :: \overset{\text{ac.}}{45} \\ \ \ 4 : 25 \end{array}$$

$$\frac{108 \times 25 \times 45}{75 \times 4} = 9 \times 45 = \overset{\text{ac.}}{405}$$

(2)

$$\begin{array}{l} 16 : 96 :: \overset{\pounds}{84} \\ 60 : 365 \end{array}$$

$$\frac{96 \times 365 \times 84}{16 \times 60} = 73 \times 42 = \overset{\pounds}{3066}$$

(3)

$$\begin{array}{l} 18 : 45 :: \overset{\text{sheets.}}{24} \\ \ \ 8 : 14 \end{array}$$

$$\frac{45 \times 14 \times 24}{18 \times 8} = 15 \times 7 = \overset{\text{sheets.}}{105}$$

(4)

$$\begin{array}{l} 25 : 42 :: \overset{\text{bush.}}{8} \\ \ \ 3 : 15 \end{array}$$

$$\frac{42 \times 15 \times 8}{25 \times 3} = \frac{42 \times 8}{5} = \frac{\overset{\text{bush.}}{336}}{5} = \overset{\text{bush.}}{67\tfrac{1}{5}}$$

(5)

$$\begin{array}{l} 3000 : 5000 :: \overset{\text{reams.}}{66} \\ \ \ \ 22 : 25 \end{array}$$

$$\frac{5000 \times 25 \times 66}{3000 \times 22} = 5 \times 25 = \overset{\text{reams.}}{125}$$

(6)

$$\begin{array}{l} 84 : 96 :: \overset{\text{ac.}}{72} \\ 15 : 12 \end{array}$$

$$\frac{96 \times 12 \times 72}{84 \times 15} = \frac{32 \times 72}{7 \times 5} = \frac{\overset{\text{ac.}}{2304}}{35} = \overset{\text{ac.}}{65} . \overset{\text{ro.}}{3}\ \overset{\text{po.}}{12\tfrac{4}{7}}$$

(7)

$$\begin{array}{ccccc} 27 & : & 32 & :: & \overset{\text{ro.}}{54} \\ 26 & : & 39 & & \end{array}$$

$$\frac{32 \times 39 \times 54}{27 \times 26} = 32 \times 3 = \overset{\text{ro.}}{96}$$

(8)

$$\begin{array}{ccccc} 100 & : & 750 & :: & \overset{\pounds}{5} \\ 12 & : & 42 & & \end{array}$$

$$\frac{750 \times 42 \times 5}{100 \times 12} = \frac{5 \times 21 \times 5}{4} = \frac{\overset{\pounds}{525}}{4} = \overset{\pounds}{131}\ \overset{s.}{5}$$

(9)

$$\begin{array}{ccccc} 130 & : & 216 & :: & \overset{\pounds}{81} \\ 3 & : & 7 & & \end{array}$$

$$\frac{216 \times 7 \times 81}{130 \times 3} = \frac{108 \times 7 \times 27}{65} = \frac{\overset{\pounds}{20412}}{65} = \overset{\pounds}{314}\ \overset{s.}{0}\ \overset{d.}{7\tfrac{1}{4}}\tfrac{7}{13}$$

(10)

$$\pounds 7\ 17\ 6 = \overset{d.}{1890}$$

$$\begin{array}{ccccc} 350 & : & 100 & :: & \overset{d.}{1890} \\ 219 & : & 365 & & \end{array}$$

$$\frac{100 \times 365 \times 1890}{350 \times 219} = 100 \times 9 = \overset{d.}{900} = \overset{\pounds}{3}\ \overset{s.}{15}$$

(11)

$$\begin{array}{ccccc} 18 & : & 171 & :: & \overset{\text{horses.}}{10} \\ 35 & : & 7 & & \end{array}$$

$$\frac{171 \times 7 \times 10}{18 \times 35} = \overset{\text{horses.}}{19}$$

(12)

$$\begin{array}{ccccc} 8 & : & 24 & :: & \overset{\text{bar.}}{1} \\ 13 & : & 365 & & \end{array}$$

$$\frac{24 \times 365}{8 \times 13} = \frac{3 \times 365}{13} = \frac{\overset{\text{bar.}}{1095}}{13} = \overset{\text{bar.}}{84}\tfrac{3}{13}$$

(13)

$$\begin{array}{ccccc} 236 & : & 76 & :: & \overset{\text{qr.}}{160} \\ 108 & : & 432 & & \end{array}$$

$$\frac{76 \times 432 \times 160}{236 \times 108} = \frac{76 \times 160}{59} = \frac{\overset{\text{qr.}}{12160}}{59} = \overset{\text{qr.}}{206}\tfrac{6}{59}$$

(14)

$$\begin{array}{rcrcr} & & & & \text{miles.} \\ 12 & : & 60 & :: & 360 \\ 8 & : & 6 & & \end{array}$$

$$\frac{60 \times 6 \times 360}{12 \times 8} = 5 \times 6 \times 45 = \overset{\text{miles.}}{1350}$$

(15)

$$\begin{array}{rcrcr} & & & & \text{days.} \\ 20 & : & 24 & :: & 16 \\ 1 & : & 4 & & \\ 8 & : & 12 & & \end{array}$$

$$\frac{24 \times 4 \times 12 \times 16}{20 \times 8} = \frac{3 \times 12 \times 16}{5} = \overset{\text{days.}}{\frac{576}{5}} = \overset{\text{days.}}{115\tfrac{1}{5}}$$

(16)

$$\begin{array}{rcrcr} & & & & \text{bricks.} \\ 12 & : & 9 & :: & 320000 \\ 6 & : & 5 & & \\ 12 & : & 9 & & \end{array}$$

$$\frac{9 \times 5 \times 9 \times 320000}{12 \times 6 \times 12} = 5 \times 3 \times 10000 = \overset{\text{bricks.}}{150000}$$

(17)

$$\begin{array}{rcrcr} & & & & \text{days.} \\ 12 & : & 10 & :: & 6 \\ 50 & : & 90 & & \\ 200 & : & 320 & & \\ 3 & : & 4 & & \\ 4 & : & 5 & & \end{array}$$

$$\frac{10 \times 90 \times 320 \times 4 \times 5 \times 6}{12 \times 50 \times 200 \times 3 \times 4} = 4 \times 6 = \overset{\text{days.}}{24}$$

(18)

$$\begin{array}{rcrcr} & & & & s. \\ 18 & : & 54 & :: & 15 \\ 3 & : & 27 & & \\ 54 & : & 50 & & \end{array}$$

$$\frac{54 \times 27 \times 50 \times 15}{18 \times 3 \times 54} = 25 \times 15 = \overset{s.}{375} = \overset{\pounds}{18}\ \overset{s.}{15}$$

(19)

$$\begin{array}{rrrcrcrrrcr} \text{cwt.} & \text{qr.} & \text{lb.} & & \text{lb.} & & \pounds & s. & d. & & f. \\ 0 & 2 & 7 & = & 63; & & 0 & 8 & 7\tfrac{1}{2} & = & 414 \\ 1 & 3 & 14 & = & 210; & & 1 & 7 & 6 & = & 1320 \end{array}$$

$$\begin{array}{rcrcr} & & & & \text{miles.} \\ 210 & : & 63 & :: & 54 \\ 414 & : & 1320 & & \end{array}$$

$$\frac{63 \times 1320 \times 54}{210 \times 414} = \frac{132 \times 9}{23} = \overset{\text{miles.}}{\frac{1188}{23}} = \overset{\text{miles.}}{51\tfrac{15}{23}}$$

(20)

$$\begin{array}{lcclcc} & \text{miles.} & & \text{yd.} & \text{days.} \\ & 2\tfrac{1}{2} & = & 4400 & 84 \\ \text{Subtract} & . & . & 880 & 54 \\ \hline & & & 3520 & 30 \end{array}$$

The question now is—if 60 men finish 880 yards in 54 days, how many men will finish 3520 yards in 30 days?

$$\begin{array}{ccccc} & & & & \text{men.} \\ 880 & : & 3520 & :: & 60 \\ 30 & : & 54 & & \end{array}$$

$$\frac{3520 \times 54 \times 60}{880 \times 30} = 4 \times 54 \times 2 = \overset{\text{men.}}{432}$$

$\therefore$ 432 − 60 = 372 additional men to be engaged.

PROPORTION OF VULGAR FRACTIONS.

Page 134.

(1)

$$\frac{3}{4} : \frac{9}{14} :: \overset{£}{\frac{7}{18}}$$

$$\therefore \frac{9}{14} \times \frac{7}{18} \times \frac{4}{3} = \overset{£}{\frac{1}{3}} = \overset{s.}{6}\ \overset{d.}{8}$$

(2)

$$\overset{\text{yd.}}{14\tfrac{3}{7}} = \overset{\text{yd.}}{\frac{101}{7}};\ \overset{£}{2\tfrac{5}{48}} = \overset{£}{\frac{101}{48}}$$

$$5\tfrac{3}{5} = \frac{28}{5}$$

$$\frac{101}{7} : \frac{28}{5} :: \overset{£}{\frac{101}{48}}$$

$$\frac{28}{5} \times \frac{101}{48} \times \frac{7}{101} = \frac{7 \times 7}{5 \times 12} = \overset{£}{\frac{49}{60}} = \overset{s.}{16}\ \overset{d.}{4}$$

(3)

$$\overset{\text{ac.}}{5\tfrac{3}{7}} = \overset{\text{ac.}}{\frac{38}{7}};\quad \overset{\pounds}{59}\ \ \overset{s.}{6}\ \ \overset{d.}{6} = \overset{\pounds}{\frac{14238}{240}}$$

$$1\tfrac{7}{12} = \frac{19}{12}$$

$$\frac{19}{12} : \frac{38}{7} :: \overset{\pounds}{\frac{14238}{240}}$$

$$\frac{38}{7} \times \frac{14238}{240} \times \frac{12}{19} = \overset{\pounds}{\frac{1017}{5}} = \overset{\pounds}{203}\ \ \overset{s.}{8}$$

(4)

$$\overset{\text{yd.}}{5\tfrac{3}{7}} = \overset{\text{yd.}}{\frac{38}{7}};\quad \overset{s.}{7}\ \ \overset{d.}{6} = \overset{\pounds}{\frac{90}{240}}$$

$$\frac{3}{4} : \frac{38}{7} :: \overset{\pounds}{\frac{90}{240}}$$

$$\frac{38}{7} \times \frac{90}{240} \times \frac{4}{3} = \overset{\pounds}{\frac{19}{7}} = \overset{\pounds}{2}\ \ \overset{s.}{14}\ \ \overset{d.}{3\tfrac{1}{4}\tfrac{5}{7}}$$

(5)

$$\overset{s.}{5\tfrac{4}{9}} = \overset{s.}{\frac{49}{9}};\quad \overset{\text{lb.}}{1\tfrac{5}{18}} = \overset{\text{lb.}}{\frac{23}{18}}$$

$$\overset{\pounds}{7\tfrac{7}{12}} = \overset{s.}{\frac{1820}{12}}$$

$$\frac{49}{9} : \frac{1820}{12} :: \overset{\text{lb.}}{\frac{23}{18}}$$

$$\frac{1820}{12} \times \frac{23}{18} \times \frac{9}{49} = \frac{65 \times 23}{6 \times 7} = \overset{\text{lb.}}{\frac{1495}{42}} = \overset{\text{lb.}}{35\tfrac{25}{42}}$$

(6)

$$\overset{\pounds}{475}\ \ \overset{s.}{10} = \overset{\pounds}{\frac{951}{2}};\quad \frac{8}{9} \text{ of } \frac{23}{24} = \frac{23}{27}$$

$$\frac{1}{16} : \frac{23}{27} :: \overset{\pounds}{\frac{951}{2}}$$

$$\frac{23}{27} \times \frac{951}{2} \times \frac{16}{1} = \frac{23 \times 317 \times 8}{9} = \overset{\pounds}{\frac{58328}{9}} = \overset{\pounds}{6480}\ \ \overset{s.}{17}\ \ \overset{d.}{9\tfrac{1}{4}\tfrac{1}{3}}$$

(7)

$$\overset{\text{cwt.}}{8}\ \overset{\text{qr.}}{3}\ \overset{\text{lb.}}{0} = \overset{\text{lb.}}{\frac{980}{1}};\quad \overset{s.}{2}\ \overset{d.}{7\tfrac{1}{2}} = \overset{£}{\frac{63}{480}}$$

$$4\tfrac{3}{8} = \frac{35}{8}$$

$$\frac{35}{8} : \frac{980}{1} :: \overset{£}{\frac{63}{480}}$$

$$\frac{980}{1} \times \frac{63}{480} \times \frac{8}{35} = \frac{49 \times 3}{5} = \frac{147}{5} = \overset{£}{29}\ \overset{s.}{8}$$

(8)

$$\overset{\text{cwt.}}{3}\ \overset{\text{lb.}}{14} = \overset{\text{lb.}}{\frac{350}{1}};\quad \overset{s.}{5}\ \overset{d.}{7} = \overset{£}{\frac{67}{240}}$$

$$1\tfrac{1}{8} = \frac{9}{8}$$

$$\frac{9}{8} : \frac{350 \times 3}{1} :: \overset{£}{\frac{67}{240}}$$

$$\frac{350 \times 3}{1} \times \frac{67}{240} \times \frac{8}{9} = \frac{35 \times 67}{9} = \overset{£}{\frac{2345}{9}} = \overset{£}{260}\ \overset{s.}{11}\ \overset{d.}{1\tfrac{1}{4}\,\tfrac{1}{3}}$$

(9)

$$£7\tfrac{1}{5} = £\frac{36}{5};\quad \overset{\text{gal.}}{6\tfrac{3}{17}} = \overset{\text{gal.}}{\frac{105}{17}}$$

$$£27,\ 15s.\ 6d. = £\frac{6666}{240}$$

$$\frac{36}{5} : \frac{6666}{240} :: \overset{\text{gal.}}{\frac{105}{17}}$$

$$\frac{6666}{240} \times \frac{105}{17} \times \frac{5}{36} = \frac{1111 \times 35}{8 \times 17 \times 12} = \frac{38885}{1632} = \overset{\text{gal.}}{23\tfrac{1348}{1632}}$$

(10)

$$13\tfrac{1}{2}\text{ oz.} = \overset{\text{oz.}}{\frac{27}{2}};\quad \overset{£}{1\tfrac{4}{5}} = \overset{£}{\frac{9}{5}}$$

$$18\tfrac{6}{7}\text{ lb.} = \frac{132}{7}\text{ lb.} = \frac{2112}{7}$$

$$\frac{27}{2} : \frac{2112}{7} :: \overset{£}{\frac{9}{5}}$$

$$\frac{2112}{7} \times \frac{9}{5} \times \frac{2}{27} = \frac{704 \times 2}{7 \times 5} = \overset{£}{\frac{1408}{35}} = \overset{£}{40}\ \overset{s.}{4}\ \overset{d.}{6\tfrac{3}{4}\,\tfrac{3}{7}}$$

(11)
$$1\text{ oz. }2\tfrac{1}{2}\text{ dwt.} = \overset{\text{dwt.}}{\frac{45}{2}};\quad \overset{s.}{7}\ \ \overset{d.}{10\tfrac{1}{2}} = \overset{£}{\frac{378}{960}}$$

$$1\text{ lb. }7\tfrac{1}{3}\text{ oz.} = \frac{1160}{3}$$

$$\frac{45}{2} : \frac{1160}{3} :: \overset{£}{\frac{378}{960}}$$

$$\frac{1160}{3} \times \frac{378}{960} \times \frac{2}{45} = \frac{29 \times 21}{2 \times 45} = \overset{£}{\frac{609}{90}} = \overset{£}{6}\ \ \overset{s.}{15}\ \ \overset{d.}{4}$$

(12)
$$5\tfrac{5}{9}\text{ yd.} = \overset{\text{yd.}}{\frac{50}{9}};\quad \overset{£}{7}\ \ \overset{s.}{8}\ \ \overset{d.}{11\tfrac{1}{2}} = \overset{£}{\frac{7150}{960}}$$

$$24\tfrac{3}{8}\text{ En. e.} = \frac{975}{32}$$

$$\frac{50}{9} : \frac{975}{32} :: \overset{£}{\frac{7150}{960}}$$

$$\frac{975}{32} \times \frac{7150}{960} \times \frac{9}{50} = \frac{195 \times 143 \times 3}{32 \times 64} = \overset{£}{\frac{83655}{2048}} = \overset{£}{40}\ \ \overset{s.}{16}\ \ \overset{d.}{11\tfrac{1}{4}\tfrac{9}{32}}$$

(13)
$$\overset{£}{2\tfrac{5}{8}} = \overset{£}{\frac{21}{8}};\quad \overset{\text{cwt.}}{1\tfrac{3}{8}} = \overset{\text{cwt.}}{\frac{11}{8}}$$

$$£7\tfrac{7}{11} = \frac{84}{11}$$

$$\frac{21}{8} : \frac{84}{11} :: \overset{\text{cwt.}}{\frac{11}{8}}$$

$$\frac{84}{11} \times \frac{11}{8} \times \frac{8}{21} = \overset{\text{cwt.}}{4}$$

(14)
$$\overset{\text{cwt.}}{5\tfrac{4}{9}} = \overset{\text{lb.}}{\frac{5488}{9}};\quad \overset{£}{16}\ \ \overset{s.}{4}\ \ \overset{d.}{9\tfrac{1}{4}} = \overset{£}{\frac{15589}{960}}$$

$$17\tfrac{1}{7}\text{ lb.} = \frac{120}{7}$$

$$\frac{5488}{9} : \frac{120}{7} :: \overset{£}{\frac{15589}{960}}$$

$$\frac{120}{7} \times \frac{15589}{960} \times \frac{9}{5488} = \frac{2227 \times 9}{8 \times 5488} = \overset{£}{\frac{20043}{43904}} = \overset{s.}{9}\ \ \overset{d.}{1\tfrac{1}{4}\tfrac{177}{686}}$$

(15)
$$\overset{\text{miles.}}{27\tfrac{1}{2}} = \overset{\text{miles.}}{\frac{55}{2}};\quad \overset{\text{miles.}}{22\tfrac{3}{4}} = \overset{\text{miles.}}{\frac{91}{4}};\quad \overset{\text{hours.}}{2\tfrac{5}{12}} = \overset{\text{hours.}}{\frac{29}{12}}.$$

$$\frac{91}{4} : \frac{55}{2} :: \overset{\text{hours.}}{\frac{29}{12}}$$

$$\frac{4}{91} \times \frac{55}{2} \times \frac{29}{12} = \frac{55 \times 29}{91 \times 2 \times 3} = \frac{1595}{546} = \overset{\text{hours.}}{2\tfrac{503}{546}}.$$

(16)
$$\overset{\text{miles.}}{4\tfrac{3}{8}} = \overset{\text{miles.}}{\frac{35}{8}};\quad \overset{\text{miles.}}{5\tfrac{4}{9}} = \overset{\text{miles.}}{\frac{49}{9}};\quad \overset{\text{hours.}}{7\tfrac{7}{9}} = \overset{\text{hours.}}{\frac{70}{9}}.$$

$$\frac{49}{9} : \frac{35}{8} :: \overset{\text{hours.}}{\frac{70}{9}}$$

$$\frac{9}{49} \times \frac{35}{8} \times \frac{70}{9} = \frac{5 \times 10}{8} = \frac{25}{4} = \overset{\text{hours.}}{6\tfrac{1}{4}}.$$

REDUCTION OF DECIMAL FRACTIONS.

Page 139.

(17) $\cdot 125 = \frac{125}{1000} = \frac{1}{8}$, by dividing both terms by 125.

$\cdot 824 = \frac{824}{1000} = \frac{103}{125}$, 〃 〃 〃 8.

$\cdot 925 = \frac{925}{1000} = \frac{37}{40}$, 〃 〃 〃 25.

$\cdot 72375 = \frac{72375}{100000} = \frac{579}{800}$, 〃 〃 〃 125.

(18) $\cdot 21875 = \frac{21875}{100000} = \frac{7}{32}$, 〃 〃 by 3125.

$\cdot 00112 = \frac{112}{10000} = \frac{7}{625}$, 〃 〃 〃 16.

$\cdot 14375 = \frac{14375}{100000} = \frac{23}{160}$, 〃 〃 〃 625.

$\cdot 7125 = \frac{7125}{10000} = \frac{57}{80}$, 〃 〃 〃 125.

(19) $\cdot015625 = \frac{15625}{1000000} = \frac{5}{320}$, by dividing both terms by 3125.

$\cdot08125 = \frac{8125}{100000} = \frac{13}{160}$, " " " 625.

$\cdot2125 = \frac{2125}{10000} = \frac{17}{80}$, " " " 125.

$\cdot1175 = \frac{1175}{10000} = \frac{47}{400}$, " " " 25.

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(20)
$$\begin{array}{r|l} 12 & 6 \\ 20 & 12\cdot5 \\ \hline & \pounds\ \cdot625 \end{array} \qquad \begin{array}{r|l} 12 & 4 \\ 20 & 5\cdot\dot{3} \\ \hline & \pounds\ \cdot2\dot{6} \end{array} \qquad \begin{array}{r|l} 4 & 2 \\ 12 & 3\cdot5 \\ 2,0 & 6\cdot291\dot{6} \\ \hline & \pounds\ \cdot31458\dot{3} \end{array}$$

(21)
$$\begin{array}{r|l} 4 & 3 \\ 12 & 5\cdot75 \\ 20 & 17\cdot4791\dot{6} \\ \hline & \pounds\ \cdot873958\dot{3} \end{array} \qquad \begin{array}{r|l} 4 & 2 \\ 12 & 7\cdot5 \\ 20 & 18\cdot625 \\ \hline & \pounds\ \cdot93125 \end{array} \qquad \begin{array}{r|l} 12 & 6 \\ 20 & 13\cdot5 \\ \hline & \pounds\ \cdot625 \end{array}$$

(22)
$$\begin{array}{r|l} 4 & 1 \\ 12 & 10\cdot25 \\ 20 & 3\cdot8541\dot{6} \\ \hline & \pounds\ \cdot192708\dot{3} \end{array} \qquad \begin{array}{r|l} 12 & 9 \\ 20 & 19\cdot75 \\ \hline & \pounds\ \cdot9875 \end{array} \qquad \begin{array}{r|l} 12 & 8 \\ 20 & 16\cdot\dot{6} \\ \hline & \pounds\ \cdot8\dot{3} \end{array}$$

(23)
$$\begin{array}{r|l} 12 & 4 \\ 20 & 0\cdot\dot{3} \\ \hline & \pounds\ \cdot01\dot{6} \end{array} \qquad \begin{array}{r|l} 12 & 6 \\ 20 & 0\cdot5 \\ \hline & \pounds\ \cdot025 \end{array} \qquad \begin{array}{r|l} 12 & 8 \\ 20 & 0\cdot\dot{6} \\ \hline & \pounds\ \cdot0\dot{3} \end{array}$$

(24)
$$\begin{array}{r|l} 12 & 2 \\ 21 & 1\cdot1\dot{6} \\ \hline & \cdot0\dot{5} \end{array} \qquad \begin{array}{r|l} 4 & 2 \\ 12 & 5\cdot5 \\ 21 & 3\cdot458\dot{3} \\ \hline & \cdot164\dot{6}8253\dot{9} \end{array} \qquad \begin{array}{r|l} 4 & 3 \\ 12 & 2\cdot75 \\ 21 & 6\cdot2291\dot{6} \\ \hline & \cdot2966\dot{2}6984\dot{1} \end{array}$$

(25)
$$\begin{array}{r|l} 24 & 12 \\ 20 & 14\cdot5 \\ 12 & 2\cdot725 \\ \hline & \cdot22708\dot{3} \end{array}$$

(26)
$$\begin{array}{r|l} 28 & 17 \\ 4 & 2\cdot60\dot{7}1428\dot{5} \\ \hline & \cdot6517\dot{8}5714\dot{2} \end{array}$$

(27)
$$\begin{array}{r|l} 28 & 8 \\ 4 & 3{\cdot}\dot{2}8571\dot{4} \\ 20 & 3{\cdot}82\dot{1}4285\dot{7} \\ \cline{2-2} & \quad {\cdot}1910\dot{7}1428\dot{5} \end{array}$$

(28)
$$\begin{array}{r|l} 28 & 15 \\ 4 & 0{\cdot}5\dot{3}57142\dot{8} \\ \cline{2-2} & 0{\cdot}1339\dot{2}8571\dot{4} \end{array}$$

(29)
$$\begin{array}{r|l} 40 & 10 \\ 4 & 1{\cdot}25 \\ \cline{2-2} & \quad {\cdot}3125 \end{array}$$

(30)
$$\begin{array}{r|l} 40 & 27 \\ 4 & 3{\cdot}675 \\ \cline{2-2} & \quad {\cdot}91875 \end{array}$$

(31)
$$\begin{array}{r|l} 60 & 51 \\ 60 & 48{\cdot}85 \\ 24 & 5{\cdot}8141\dot{6} \\ \cline{2-2} & 365{\cdot}2422569\dot{4} \end{array}$$

In pp. 140, 141 it is shewn how the first three decimal places of a *pound* are obtained. The following method of extending the decimal may prove useful:*

Take the number denoted by the second and third decimal places, multiply it by 4, reject the third figure from the right, increase the remaining number by $\frac{1}{24}$ of itself for the fourth and fifth places. Proceed in the same manner with the fourth and fifth places to obtain the sixth and seventh places.

17*s.* 5¾*d.* = $\cdot 873958\dot{3}$

Thus, taking 17*s.* 5¾*d.*, the first three decimal places are ·873. Taking 73, and multiplying it by 4, we get 292, and rejecting 2, the third figure from the right, the number 92, increased by 3, a $\frac{1}{24}$ part of itself, gives 95 for the next two places. Taking 95, multiplying it by 4, we get 380; rejecting 3, the number 80 increased by 3, a $\frac{1}{24}$ part of itself, gives 83 for the next two places. Proceeding in the same manner with 83, we find that the decimal is a recurring one.

REDUCTION OF RECURRING DECIMALS.

Page 145.

(3) $\cdot 541\dot{6} = \dfrac{5416 - 541}{9000} = \dfrac{4875}{9000} = \dfrac{13}{24}$, by dividing both terms by 375.

$\cdot 1\dot{9}\dot{6} = \dfrac{196 - 1}{990} = \dfrac{195}{990} = \dfrac{13}{66}$, by dividing both terms by 15.

$\cdot 15\dot{7}4\dot{0} = \dfrac{15740 - 15}{99900} = \dfrac{15725}{99900} = \dfrac{17}{108}$, by dividing both terms by 925.

---

* *This simple form* of extending the decimal was first given by Mr Andrew *Henderson, while* a pupil in Heriot's Hospital.

(4) $\cdot 793\dot{5} = \dfrac{7935 - 793}{9000} = \dfrac{7142}{9000} = \dfrac{3571}{4500}$, by dividing both terms by 2.

$\cdot 79\dot{3}\dot{5} = \dfrac{7935 - 79}{9900} = \dfrac{7856}{9900} = \dfrac{1964}{2475}$, by dividing both terms by 4.

$\cdot 7\dot{9}3\dot{5} = \dfrac{7935 - 7}{9990} = \dfrac{7928}{9990} = \dfrac{3964}{4995}$, by dividing both terms by 2.

$\cdot \dot{7}93\dot{5} = \dfrac{7935}{9999} = \dfrac{2645}{3333}$, by dividing both terms by 3.

(5) $32\cdot 71\dot{5} = \dfrac{32715 - 3271}{900} = \dfrac{29444}{900} = \dfrac{7361}{225}$, by dividing both terms by 4.

$7\cdot \dot{9}3\dot{6} = \dfrac{7936 - 7}{999} = \dfrac{7929}{999} = \dfrac{881}{111}$, by dividing both terms by 9.

$8\cdot 9\dot{3}\dot{6} = \dfrac{8936 - 89}{990} = \dfrac{8847}{990} = \dfrac{983}{110}$, by dividing both terms by 9.

$21\cdot 9\dot{0}4\dot{5} = \dfrac{219045 - 219}{9990} = \dfrac{218826}{9990} = \dfrac{12157}{555}$, by dividing both terms by 18.

ADDITION OF DECIMALS.

Page 146.

(5)

$\frac{7}{8} = \cdot 875$

$\frac{3}{11} = \cdot 27272727$

$\frac{1}{29} = \cdot 03448275$

$\frac{7}{25} = \cdot 28$

$\frac{13}{17} = \cdot 76470588$

$\frac{19}{400} = \cdot 0475$

$\therefore$ 2·274415

(6)

26·7802083	47·8354166
98·95	99·796875
56·7489583	47·5239583
92·6364583	53·7375
75·8802083	81·7770833
97·0489583	59·915625
448·04479	390·58645
	39·9229166
	17·6947916
	68·7875
	86·9729166
	33·5552083
	74·7895833
	321·72291

SUBTRACTION OF DECIMALS.

Page 147.

(4) $\frac{2}{7} = \cdot2857142$

$\frac{6}{23} = \cdot2608695$

$\cdot0248447$

(5)		
931·603125	179·8208333	847·5729166
395·9427083	86·8885416	359·7239583
535·66041	92·93229	487·84895

CONTRACTED MULTIPLICATION OF DECIMALS.

Page 151.

The only difficulty that is generally experienced here is the order in which the multiplier should be arranged under the multiplier, which is as follows:

(8)	(9)	(10)
71·032751	·03281674	·453
8329176·2	187·432	9610·

(11)	(12)	(13)
23·696969	4·6833	1·823572
88888231·	2392·41	5875870·

ADDITION OF RECURRING DECIMALS.

Page 154.

(1)	(2)	(8)
·7348484	4·3333333	·785478854785478
·7967967	6·4545454	8·14161416141614
·2333333	3·9090909	·285454545454545454
·7854854	5·7352352	3·908908908908890
		8·717777777777777
$2{\cdot}5\dot{4}9959\dot{0}$	$20{\cdot}4\dot{3}22049\dot{9}$	$16{\cdot}88\dot{9}233941412 1\dot{5}$

SUBTRACTION OF RECURRING DECIMALS.

Page 155.

(1)

·73256

·61919

$\cdot 1\dot{1}33\dot{7}$

(2)

4·35636363

1·47857857

$2\cdot 87\dot{7}78505\dot{5}$

(3)

·753613613613613

·437141614161416

$\cdot 316\dot{4}7199945219\dot{7}$

MULTIPLICATION OF RECURRING DECIMALS.

Page 156.

(1)

76·345

$74\cdot 8\frac{1}{3}$

$25448\frac{1}{3}$

610760

305380

534415

$5713\cdot 1508\dot{3}$

49·3865

$4\cdot 78\frac{1}{3}$

$164621\frac{2}{3}$

3950920

3457055

1975460

$236\cdot 232091\dot{6}$

(2)

·49725

$73\frac{7}{11}$

11)348075

$31643\frac{2}{11}$

149175

348075

$36\cdot 61568\dot{1}\dot{8}$

5964·5

$\cdot 72\frac{5}{11}$

11)298225

$27111\frac{4}{11}$

119290

417515

$4321\cdot 551\dot{3}\dot{6}$

(3)

3·8765

$8\cdot 76\frac{1}{11}$

11)3·8765

$3524\frac{1}{11}$

232590

271355

310120

$83\cdot 961664\dot{0}\dot{9}$

296·25

$\cdot 99\frac{6}{11}$

11)177750

$16159\frac{1}{11}$

266625

266625

$294\cdot 9034\dot{0}\dot{9}$

(4) Here $7{\cdot}\dot{3} = 7\frac{1}{3} = \frac{22}{3}$, and $1{\cdot}\dot{9}\dot{2} = 1\frac{92}{99} = \frac{191}{99}$;

$$\therefore 7{\cdot}\dot{3} \times 1{\cdot}\dot{9}\dot{2} = \frac{22}{3} \times \frac{191}{99} = \frac{4202}{297} = 14{\cdot}\dot{1}4\dot{8}.$$

(5) Here $17{\cdot}\dot{3}\dot{6} = 17\frac{4}{11} = \frac{191}{11}$, and $5{\cdot}72\dot{4} = 5{\cdot}72\frac{4}{9} = \frac{51{\cdot}52}{9}$;

$$\therefore 17{\cdot}\dot{3}\dot{6} \times 5{\cdot}72\dot{4} = \frac{191}{11} \times \frac{51{\cdot}52}{9} = \frac{9840{\cdot}32}{99} = 99{\cdot}39\dot{7}\dot{1}.$$

(6) Here $27{\cdot}5\dot{4}\dot{5} = 27{\cdot}5\frac{5}{11} = \frac{303}{11}$, and $8{\cdot}734\dot{6} = 8{\cdot}734\frac{2}{3} = \frac{26{\cdot}204}{3}$;

$$\therefore 27{\cdot}5\dot{4}\dot{5} \times 8{\cdot}734\dot{6} = \frac{303}{11} \times \frac{26{\cdot}204}{3} = \frac{7939{\cdot}812}{33} = 240{\cdot}6003\dot{6}.$$

DIVISION OF RECURRING DECIMALS.

Page 157.

(1) Here $\cdot 7\dot{3}2\dot{6} = \frac{7326 - 7}{9990} = \frac{7319}{9990}$, and $9{\cdot}\dot{5}\dot{4} = 9\frac{6}{11} = \frac{105}{11}$;

$$\therefore \cdot 7\dot{3}2\dot{6} \div 9{\cdot}\dot{5}\dot{4} = \frac{7319}{9990} \times \frac{11}{105} = \frac{805090}{1048950} = \cdot 07\dot{6}519900858234186\dot{5}.$$

(2) Here $8{\cdot}42\dot{6}\dot{3} = 8{\cdot}42\frac{7}{11} = \frac{92{\cdot}69}{11}$, and $16{\cdot}85\dot{2}\dot{7} = 16{\cdot}85\frac{3}{11} = \frac{185{\cdot}38}{11}$;

$$\therefore 8{\cdot}42\dot{6}\dot{3} \div 16{\cdot}85\dot{2}\dot{7} = \frac{92{\cdot}69}{11} \times \frac{11}{185{\cdot}38} = \frac{9269}{18538} = \cdot 5.$$

(3) Here $\cdot 26\dot{2}\dot{7} = \cdot 26\frac{3}{11} = \frac{2{\cdot}89}{11}$, and $1{\cdot}92\dot{6} = 1{\cdot}92\frac{2}{3} = \frac{5{\cdot}78}{3}$;

$$\therefore \cdot 26\dot{2}\dot{7} \div 1{\cdot}92\dot{6} = \frac{2{\cdot}89}{11} \times \frac{3}{5{\cdot}78} = \frac{8{\cdot}67}{63{\cdot}58} = \frac{3}{22} = \cdot 1\dot{3}\dot{6}.$$

MISCELLANEOUS EXERCISES IN DECIMALS.

Page 158.

(1) $16{\cdot}1 \times 12^2 = 193{\cdot}2 \times 12 = 2318{\cdot}4.$

$16{\cdot}1 \times 14^2 = 225{\cdot}4 \times 14 = 3155{\cdot}6.$

$16{\cdot}1 \times (20{\cdot}5)^2 = 330{\cdot}05 \times 20{\cdot}5 = 6766{\cdot}025.$

(2) $3{\cdot}14159 \times (20{\cdot}75)^2 = 65{\cdot}1879925 \times 20{\cdot}75 = 1352{\cdot}650844375.$

(3) In this series it is necessary to observe that each term is derived from the former by dividing that term by the number which represents the place of the term sought from the beginning of the series; thus, the third term is derived from the second by dividing by 3, and the fourth from the third by dividing by 4, &c.

	2
3	·500000000000000
4	·166666666666666
5	·041666666666667
6	·008333333333333
7	·001388888888889
8	·000198412698413
9	·000024801587302
10	·000002755731925
11	·000000275573192
12	·000000025052108
13	·000000002087676
14	·000000000160590
15	·000000000011471
16	·000000000000765
17	·000000000000048
	·000000000000003
Sum =	2·718281828459048

(4)
$$113 : 355 \; :: \; 1 : \frac{355}{113} = 3{\cdot}14159,$$

$$355 : 113 \; :: \; 1 : \frac{113}{355} = {\cdot}31831.$$

(5)
$$10474 : 19258 \; :: \; 1 : \frac{19258}{10474} = 1{\cdot}83864,$$

$$19258 : 10474 \; :: \; 1 : \frac{10474}{19258} = {\cdot}543878.$$

(6) In this series it is best to calculate the powers of the fractions first, and then divide the results by the other figures in the denominator, arranging the quotients into two columns—namely, the + and − parts.

			+ part.	− part.
25	·2		·2000000	
25	·008 ÷ 3			·0026667
25	·00032 ÷ 5	=	·0000640	
25	·0000128 ÷ 7	=		·0000018
	·0000005 ÷ 9		·0000001	
			·2000641	·0026685
		−	·0026685	
			·1978956 × 16 =	3·1583296
	4 times $\frac{1}{239}$ (one term is enough) =			·0167364
				3·1415932

Note.—The second term of the second series would be $\frac{4}{40955757}$, which gives no figure till the eighth decimal place, and is therefore omitted.

COMMERCIAL ALLOWANCES.

Page 160.

(1)

	cwt.	qr.	lb.
Gross weight, .	35	0	2
Subtract tare,	4	1	25
Net weight, . .	30	2	5

tare, cwt. 4 qr. 1 lb. 25

(2)

Gross weight, .	15	2	1
Draft, ...			8
	15	1	21
4 lb. = $\frac{1}{28}$ cwt.	0	2	6
	14	3	15 net weight.

lb.		£	s.	d.
1667	at 1*s.* 9½*d.* per lb. =	149	6	8½

(3)

	cwt.	qr.	lb.
Gross weight, ...	6	2	4
29 lb. × 3, ...	0	3	3 tare.
	5	3	1 net weight.

(4)

$$\begin{array}{lrrrlrrr}
 & \text{cwt.} & \text{qr.} & \text{lb.} & & \text{cwt.} & \text{qr.} & \text{lb.} \\
\text{Gross weight of 1 hhd.} = & 12 & 1 & 25 & \text{draft,} & 0 & 0 & 2 \\
\quad\text{Deduct, ...} & 1 & 3 & 1 & \text{tare,} & 1 & 2 & 27 \\ \cline{2-4}\cline{6-8}
\text{Net weight of 1 hhd. . . .} & 10 & 2 & 24 & & 1 & 3 & 1 \\
 & & & 7 & & & & \\ \cline{2-4}
 & 75 & 0 & 0 & & & &
\end{array}$$

(5)

$$\begin{array}{lrrrl}
 & \text{cwt.} & \text{qr.} & \text{lb.} & \\
\text{Gross weight,} & 7 & 0 & 17 & \\
\quad 2 \times 5 \;= & 0 & 0 & 10 & \text{draft.} \\ \cline{2-4}
\text{lb.} & 7 & 0 & 7 & \\ \cline{2-4}
16 = \frac{1}{7} \text{ of 1 cwt.} & 1 & 0 & 1 & \\
\;\; 4 = \frac{1}{4} \text{ of } \quad " & 0 & 1 & 0 & \\ \cline{2-4}
 & 1 & 1 & 1 & \text{tare.} \\ \cline{2-4}
 & 5 & 3 & 6 & \text{net weight.}
\end{array}$$

cwt. qr. lb.   £ *s.* *d.*
5 3 6 at 18*s.* 7½*d.* per cwt. = 5 8 1 nearly.

$$\begin{array}{lrrll}
 & \pounds & s. & d. & \\
 & 0 & 18 & 7\frac{1}{2} & \\
 & & & 5 & \\ \cline{2-4}
 & 4 & 13 & 1\frac{1}{2} & \\
2 \text{ qr.} = \frac{1}{2} \text{ of 1 cwt.} & 0 & 9 & 3\frac{3}{4} & \\
1 \text{ qr.} = \frac{1}{2} \text{ of 2 qr.} & 0 & 4 & 7\frac{3}{4} & \frac{1}{2} \\
4 \text{ lb.} = \frac{1}{7} \text{ of 1 qr.} & 0 & 0 & 7\frac{3}{4} & \frac{13}{14} \\
2 \text{ lb.} = \frac{1}{2} \text{ of 4 lb.} & 0 & 0 & 3\frac{3}{4} & \frac{27}{28} \\ \cline{2-5}
 & 5 & 8 & 1\frac{0}{4} & \frac{11}{28}
\end{array}$$

PERCENTAGES.

Page 162.

(1) $100 : 24 \;::\; 6 : \dfrac{24 \times 6}{100} = \dfrac{144}{100} =$ £1, 8*s.* 9½*d.* ⅗.

(2) £2, 2*s.* = 42*s.*, and £1, 15*s.* = 35*s.*

∴ 42 − 35 = 7*s.* the gain on 42*s.*

$\overset{s.}{42} : \overset{s.}{7} \;::\; \overset{\pounds}{100} : \dfrac{100 \times 7}{42} = \dfrac{100}{6} =$ £16, 13*s.* 4*d.*

(3) $4\frac{1}{2} : 60 \;::\; 100 : \dfrac{60 \times 100}{4\frac{1}{2}} = \dfrac{12000}{9} =$ £1333, 6*s.* 8*d.*

(4) $6 : 60 \;::\; 100 : \dfrac{60 \times 100}{6} =$ £1000.

(5) $$2000 : 100 \ :: \ £82 : \frac{82 \times 100}{2000} = \frac{82}{20} = £4\tfrac{1}{10}.$$

(6) $$3 : 8 \ :: \ 100 : \frac{8 \times 100}{3} = \frac{800}{3} = £266,\ 13s.\ 4d.$$

(7) Here $1232 - 997 = 235$ = the increase on 997.

$$997 : 100 :: \ 235 : \frac{235 \times 100}{997} = £23,\ 11s.\ 4\tfrac{3}{4}d.\ \tfrac{881}{997}.$$

(8) Here $555620 - 510965 = 44655$ = the decrease on 555620,

$$555620 : 100 \ :: \ 44655 : \frac{44655 \times 100}{555620}$$
$$= \frac{223275}{27781} = 8\tfrac{1027}{27781} = 8\tfrac{79}{2137}.$$

(9) $$\overset{s.}{15} : \overset{£}{100} \ :: \ \overset{s.}{1} : \frac{100}{15} = £6,\ 13s.\ 4d.$$

(10) Here £100 — £5 = £95 = the selling of what cost £100.

$$\overset{£}{95} : \overset{£}{100} :: \overset{s.}{18} : \frac{18 \times 100}{95} = \frac{360}{19} = 18s.\ 11\tfrac{1}{4}d.\ \tfrac{9}{19}.$$

(11) $$\overset{£}{100} : \overset{£}{4000} \ :: \ \overset{£}{1\tfrac{1}{2}} : \frac{4000 \times 1\tfrac{1}{2}}{100} = \frac{6000}{100} = £60.$$

SIMPLE INTEREST.

Page 164.

(1)
$$\begin{array}{r l}
 & £ \\
 & 185 \\
 & 2 \\ \hline
100) & 370 \\ \hline
 & £\ 3\ \ 14
\end{array}$$

(2)
$$\begin{array}{r r r r}
 & £ & s. & d. \\
 & 240 & 10 & 0 \\
 & & & 2\tfrac{1}{2} \\ \hline
 & 120 & 5 & 0 \\
 & 481 & 0 & 0 \\ \hline
100) & 601 & 5 & 0 \\ \hline
 & £\ 6 & 0 & 3
\end{array}$$

(3)
$$\begin{array}{r r r r}
 & £ & s. & d. \\
 & 175 & 6 & 8 \\
 & & & 3 \\ \hline
100) & 526 & 0 & 0 \\ \hline
 & £\ 5 & 5 & 2\tfrac{1}{4}\ \tfrac{3}{5}
\end{array}$$

(4)
$$\begin{array}{r r r r}
 & £ & s. & d. \\
 & 310 & 9 & 8 \\
 & & & 3\tfrac{1}{2} \\ \hline
 & 155 & 4 & 10 \\
 & 931 & 9 & 0 \\ \hline
100) & 1086 & 13 & 10 \\ \hline
 & £\ 10 & 17 & 4\tfrac{0}{4}\ \tfrac{6}{25}
\end{array}$$

(5)

£ s. d.
295 14 10
4
100)1182 19 4
£ 11 16 7$\frac{0}{4}$ $\frac{12}{25}$

(6)

£ s. d.
751 15 0
5
100)3758 15 0
£ 37 11 9

(7)

£ s. d.
847 16 8
2
1695 13 4
3
100)5087 0 0
£ 50 17 4$\frac{3}{4}$ $\frac{1}{5}$

£
847·833
2
1695·666
3
1,00)50,86·998
50·869 = £50 17 4$\frac{3}{4}$

(8)

£ s. d.
1256 10 6$\frac{1}{2}$
7
8795 18 9$\frac{1}{2}$
2$\frac{1}{2}$
100)21989 4 5$\frac{3}{4}$
£ 219 17 10$\frac{0}{4}$ $\frac{11}{20}$

£
1256·527
7
8795·689
2$\frac{1}{2}$
1,00)219 89·222
219·892 = £219 17 10

(9)

£ s. d.
732 15 9$\frac{3}{4}$
5
3663 19 0$\frac{3}{4}$
2$\frac{1}{4}$
100)8243 17 10$\frac{1}{2}$ $\frac{3}{4}$
£ 82 8 9$\frac{1}{4}$ $\frac{31}{80}$

£
732·790
5
3663·950
2$\frac{1}{4}$
1,00)82,43·887
82·438 = £82 8 9$\frac{1}{4}$

(10)

£ s. d.
179 11 7$\frac{1}{2}$
4
718 6 6
2$\frac{3}{4}$
100)1975 7 10$\frac{1}{2}$
£ 19 15 0$\frac{3}{4}$ $\frac{38}{50}$

£
179·581
4
718·824
2$\frac{3}{4}$
1,00)19.75·391
19·753 = £19 15 0$\frac{3}{4}$

(11)

$$\begin{array}{rrrl}
 & \pounds & s. & d. \\
 & 273 & 19 & 10 \\
 & & & 3\frac{1}{2} \\ \hline
 & 958 & 19 & 5 \\
 & & & 3 \\ \hline
100) & 2876 & 18 & 3 \\ \hline
 & \pounds 28 & 15 & 4\frac{1}{2}\ \frac{9}{25}
\end{array}
\qquad
\begin{array}{rl}
 & \pounds \\
 & 273\cdot991 \\
 & 3\frac{1}{2} \\ \hline
 & 958\cdot968 \\
 & 3 \\ \hline
1,00) & 28,76\cdot904 \\ \hline
 & 28\cdot769 = \pounds 28\ 15\ \ 4\frac{1}{2}
\end{array}$$

(12)

$$\begin{array}{rrrl}
 & \pounds & s. & d. \\
 & 2685 & 18 & 6\frac{1}{4} \\
 & & & 9\frac{1}{4} \\ \hline
 & 24844 & 16 & 3\frac{3}{4}\ \frac{1}{4} \\
 & & & 3\frac{1}{4} \\ \hline
100) & 80745 & 13 & 0\frac{1}{4}\ \frac{9}{16} \\ \hline
 & \pounds 807 & 9 & 1\frac{1}{2}\ \frac{409}{1600}
\end{array}
\qquad
\begin{array}{rl}
 & \pounds \\
 & 2685\cdot926 \\
 & 9\frac{1}{4} \\ \hline
 & 24844\cdot815 \\
 & 3\frac{1}{4} \\ \hline
1,00) & 807,45\cdot648 \\ \hline
 & 807\cdot456 = \pounds 807\ \ 9\ \ 1\frac{1}{2}
\end{array}$$

(13)

$$\begin{array}{rrrl}
 & \pounds & s. & d. \\
 & 1751 & 9 & 2\frac{1}{8} \\
 & & & 11 \\ \hline
 & 19266 & 1 & 3\frac{1}{8} \\
 & & & 3\frac{7}{8} \\ \hline
100) & 74656 & 0 & 0\frac{2}{4}\ \frac{1}{4} \\ \hline
 & \pounds 746 & 11 & 2\frac{1}{4}\ \frac{241}{400}
\end{array}
\qquad
\begin{array}{rl}
 & \pounds \\
 & 1751\cdot460 \\
 & 11 \\ \hline
 & 19266\cdot060 \\
 & 3\frac{7}{8} \\ \hline
1,00) & 746,55\cdot982 \\ \hline
 & 746\cdot559 = \pounds 746\ 11\ \ 2\frac{1}{4}
\end{array}$$

(14)

$$\begin{array}{rrrl}
 & \pounds & s. & d. \\
 & 987 & 1 & 8\frac{1}{4} \\
 & & & 5\frac{3}{4} \\ \hline
 & 5675 & 14 & 8\frac{1}{4}\ \frac{3}{4} \\
 & & & 4\frac{1}{2} \\ \hline
100) & 25540 & 16 & 1\frac{3}{4}\ \frac{7}{8} \\ \hline
 & \pounds 255 & 8 & 1\frac{3}{4}\ \frac{687}{800}
\end{array}
\qquad
\begin{array}{rl}
 & \pounds \\
 & 987\cdot084 \\
 & 5\frac{3}{4} \\ \hline
 & 5675\cdot733 \\
 & 4\frac{1}{2} \\ \hline
1,00) & 255,40\cdot798 \\ \hline
 & 255\cdot407 = \pounds 255\ \ 8\ \ 1\frac{3}{4}
\end{array}$$

(15)

$$\begin{array}{rrrl}
 & \pounds & s. & d. \\
 & 567 & 8 & 9\frac{3}{4} \\
 & & & 6 \\ \hline
 & 3404 & 12 & 10\frac{1}{2} \\
 & & & 2\frac{7}{8} \\ \hline
100) & 9788 & 7 & 0\frac{2}{4}\ \frac{3}{4} \\ \hline
 & \pounds 97 & 17 & 8\frac{2}{4}\ \frac{67}{400}
\end{array}
\qquad
\begin{array}{rl}
 & \pounds \\
 & 567\cdot440 \\
 & 6 \\ \hline
 & 3404\cdot640 \\
 & 2\frac{7}{8} \\ \hline
1,00) & 97,88\cdot340 \\ \hline
 & 7\cdot883 = \pounds 97\ 17\ \ 8
\end{array}$$

	£	s.	d.		£
(16)	275	19	2		275·958
			2½		2½
	689	17	11		689·895
			5		5
	100)3449	9	7		1,00)34,49·475
	£34	9	10¾		34·494 = £34 9 10¾

	£	s.	d.		£
(17)	111	11	1		111·554
			9		9
	1003	19	9		1003·986
			4⅗		4⅗
	100)4618	6	$10\frac{0}{4}$	⅘	1,00)46,18·335
	£46	3	$8\frac{0}{4}$	$\frac{11}{125}$	46·183 = £46 3 8

	£	s.	d.		£
(18)	187	16	10		187·841
			5		5
	939	4	2		939·205
			4½		4½
	1200)4226	8	9		12,00)42,26·422
	£3	10	5¼	$\frac{3}{20}$	3·522 = £3 10 5¼

	£	s.	d.		£
(19)	9325	14	3		9325·712
			14		14
	130559	19	6		130559·968
			6		6
	1200)783359	17	0		12,00)7833,59·808
	£652	15	11¾	$\frac{22}{25}$	652·799 = £652 15 11¾

	£	s.	d.		£
(20)	416	9	7		416·479
			8½		8½
	3540	1	5½		3540·071
			2¾		2¾
	1200)9735	4	$0\frac{0}{4}$	½	12,00)97,35·195
	£8	2	$3\frac{0}{4}$	$\frac{77}{480}$	8·112 = £8 2 3

	£	s.	d.		£
(21)	172	1	11		172·095
			22		22
	3786	2	2		3786·090
			$3\frac{5}{8}$		$3\frac{5}{8}$
	1200)13724	12	$10\frac{1}{4}$		12,00)137,24·576
	£11	8	$8\frac{3}{4}$	$\frac{857}{1200}$	11·437 = £11 8 9

	£	s.	d.		£
(22)	395	7	8		395·383
			29		29
	11466	2	4		11466·107
			4		4
	1200)45864	9	4		12,00)458,64·428
	£38	4	$4\frac{3}{4}$	$\frac{43}{75}$	38·220 = £38 4 $4\frac{3}{4}$

	£	s.	d.		£
(23)	916	3	$6\frac{1}{2}$		916·177
			$7\frac{1}{2}$		$7\frac{1}{2}$
	6871	6	$6\frac{3}{4}$		6871·327
			$5\frac{1}{2}$		$5\frac{1}{2}$
	1200)37792	6	$1\frac{0}{4}$ $\frac{1}{2}$		12,00)377,92'298
	£31	9	$10\frac{1}{4}$	$\frac{27}{32}$	31·493 = £31 9 $10\frac{1}{4}$

	£	s.	d.		£
(24)	872	19	9		872·987
			$3\frac{1}{4}$		$3\frac{1}{4}$
	2837	4	$2\frac{1}{4}$		2837·207
			$4\frac{1}{4}$		$4\frac{1}{4}$
	1200)12058	2	$9\frac{1}{2}$ $\frac{1}{4}$		12,00)120,58·129
	£10	0	$11\frac{1}{2}$	$\frac{819}{1600}$	10·048 = £10 0 $11\frac{1}{2}$

	£	s.	d.		£
(25)	541	2	4		541·116
			$17\frac{1}{2}$		$17\frac{1}{2}$
	9469	10	10		9469·530
			$6\frac{3}{4}$		$6\frac{3}{4}$
	1200)63919	8	$1\frac{1}{2}$		12,00)639,19·327
	£53	5	$3\frac{3}{4}$	$\frac{21}{40}$	53·266 = £53 5 $3\frac{3}{4}$

	£	s.	d.		£
(26)	193	11	3		193·562
			47		47
	9097	8	9		9097'414
			$4\frac{3}{8}$		$4\frac{3}{8}$
	1200)39801	5	$9\frac{1}{4}$ $\frac{1}{8}$		12,00)398,01·186
	£33	3	$4\frac{1}{4}$	$\frac{1}{32}$	33·167 = £33 3 $4\frac{1}{4}$

(27)

£ s. d.
217 5 $2\frac{3}{4}$
11
2389 17 $6\frac{1}{4}$
$2\frac{7}{8}$
1200)6870 17 $10\frac{1}{4}\ \frac{7}{8}$
£5 14 $6\frac{0}{4}\ \frac{6863}{9600}$

£
217·261
11
2389·871
$2\frac{7}{8}$
12,00)68,70·879
5·725 = £5 14 6

(28)

£
1000
$15\frac{1}{2}$
15500
5
1200)77500
£64 11 8

(29)

£
781
470 = 47 × 5 × 2
73000)367070
£5 0 $6\frac{3}{4}\ \frac{81}{365}$

(30)

£
1127
213
7300)240051

Interest, £32 17 $8\frac{0}{4}\ \frac{128}{365}$
Principal, 1127 0 0
Amount, £1159 17 $8\frac{0}{4}\ \frac{128}{365}$

(31)

£ s. d.
641 12 6
36
23098 10 0
9
73000)207886 10 0
£2 16 $11\frac{1}{4}\ \frac{1551}{1825}$

£
641·625
36
23098·5
9
207886·5
69295
6929
692
2·84802 = £2 16 $11\frac{1}{2}$

(32)

£ s. d.
7138 18 4
158
1127948 16 8
$6\frac{1}{2}$
73000)7331667 8 4
£100 8 8 $\frac{0}{4}\ \frac{818}{1825}$

£
7138·916
158
1127948·728
$6\frac{1}{2}$
7331666·732
2443888
244388
24438
100·44380 = £100 8 $10\frac{1}{2}$
Correction, $2\frac{1}{2}$
£100 8 8

	£	s.	d.	£
(33)	328	16	11	328·845
			81	81
	26636	10	3	26636·445
			5$\frac{1}{4}$	5$\frac{1}{4}$
73000)	139841	13	9$\frac{3}{4}$	139841·336
Interest,	£1	18	3$\frac{3}{4}$ $\frac{1023}{73000}$	46613
Principal,	328	16	11	4661
Amount,	£330	15	2$\frac{3}{4}$ $\frac{1023}{73000}$	466
				1·91581 = £1 18 3$\frac{3}{4}$

	£	s.	d.	£
(34)	584	11	3$\frac{1}{2}$	584·564
			177	177
	103467	18	7$\frac{1}{2}$	103467·828
			7$\frac{1}{2}$	7$\frac{1}{2}$
73000)	776009	9	8$\frac{1}{4}$	776008·710
	£10	12	7$\frac{1}{4}$ $\frac{821}{14600}$	258669
				25866
				2586
				10·63129 = £10 12 7$\frac{1}{2}$
				Correction, $\frac{1}{4}$
				£10 12 7$\frac{1}{4}$

	£	s.	d.	£
(35)	816	17	6$\frac{3}{4}$	816·878
			103	103
	84138	8	11$\frac{1}{4}$	84138·434
			8$\frac{3}{4}$	8$\frac{3}{4}$
73000)	736211	8	2$\frac{1}{4}$ $\frac{3}{4}$	736211·297
Interest,	£10	1	8$\frac{1}{4}$ $\frac{39963}{58400}$	245403
Principal,	816	17	6$\frac{3}{4}$	24540
Amount,	£826	19	3$\frac{0}{4}$ $\frac{39963}{58400}$	2454
				10·08608
				£10 1 8$\frac{1}{4}$

	£	s.	d.	£
(36)	875	14	6	875·725
			126	126
	110341	7	0	110341·350
			8$\frac{1}{2}$	8$\frac{1}{2}$
73000)	937901	9	6	937901·475
	£12	16	11$\frac{1}{2}$ $\frac{427}{9125}$	312633
				31263
				3126
				12·84923 = £12 16 11$\frac{3}{4}$
				Correction, $\frac{1}{4}$
				£12 16 11$\frac{1}{2}$

(37)
£ s. d.
697 8 $5\frac{1}{4}$
197
7300)137392 2 $2\frac{1}{4}$
£18 16 $5\frac{0}{4}$ $\frac{1}{292}$

£
697·421
197
137391·937
45797
4579
457
18·8224 = £18 16 $5\frac{1}{4}$
Correction, $\frac{1}{4}$
£18 16 5

(38)
£
739
220
162580
5
73000)812900
£11 2 $8\frac{1}{2}$ $\frac{14}{73}$

(39)
£
690
118
81420
$7\frac{3}{4}$
73000)631005
£8 12 $10\frac{1}{2}$ $\frac{54}{365}$

(40)
£ s.
173 15
135
7300)23456 5

	£	s.	d.
Interest,	3	4	$3\frac{0}{4}$ $\frac{48}{73}$
Principal,	173	15	0
Amount,	£176	19	$3\frac{0}{4}$ $\frac{48}{73}$

(41)

		£				Prod.
June 17.	Due,	1000	×	45	=	45000
Aug. 1.	Paid,	250				
	Bal.	750	×	71	=	53250
Oct. 11.	Paid,	300				
	Bal.	450	×	37	=	16650
Nov. 17.	Paid,	150				
	Bal.	300	×	44	=	13200
Dec. 31.	Paid,	300				

128100
$9\frac{1}{2}$
73000)1216950
£16 13 $4\frac{3}{4}$ $\frac{53}{73}$

(42)
£ Prod.
Feb. 2. Bor. 500 × 102 = 51000
May 15. Paid, 125
Bal. 375 × 78 = 29250
Aug. 1. Paid, 125
Bal. 250 × 102 = 25500
Nov. 11. Paid, 125
Bal. 125 × 50 = 6250
Dec. 31. Paid, 125 7300)112000
Interest due, . £15 6 $10\frac{0}{4}\frac{56}{73}$
Principal, . 125 0 0
Last payment, £140 6 $10\frac{0}{4}\frac{56}{73}$

(43)
£ Prod.
Jan. 1. Bor. 750 × 83 = 62250
Mar. 25. Paid, 220
Bal. 530 × 91 = 48230
June 24. Paid, 125
Bal. 405 × 97 = 39285
Sept. 29. Paid, 185
Bal. 220 × 87 = 19140
Dec. 25. Paid, 220 . . 168905
9
73000)1520145
Interest, . £20 16 $5\frac{1}{2}\frac{346}{365}$
Principal, . 220 0 0
Last payment, £240 16 $5\frac{1}{2}\frac{346}{365}$

(44)
£ Prod.
Sept. 11. Due, 320 × 73 = 23360
Nov. 23. Paid, 116
Bal. 204 × 28 = 5712
Dec. 21. Paid, 50
Bal. 154 × 29 = 4466
Jan. 19. Paid, 100
Bal. 54 × 34 = 1836
Feb. 22. Paid, 30
Bal. 24 × 78 = 1872
May 11. Paid, 24
37246
$7\frac{1}{2}$
73000)279345
£3 16 $6\frac{1}{4}\frac{211}{365}$

(45)

		£				Prod.
Mar. 14.	Lent,	456	×	47	=	21432
April 30.	Received,	66				
	Balance,	390	×	72	=	28080
July 11.	Received,	130				
	Balance,	260	×	35	=	9100
Aug. 15.	Received,	120				
	Balance,	140	×	65	=	9100
Oct. 19.	Received,	100				
	Balance,	40	×	42	=	1680
Nov. 30.	Received,	40				
						69392
						7

73000)485744

£6 13 0$\frac{3}{4}$ $\frac{1581}{1825}$

(46)

		£				Prod.
Mar. 1.	Due,	700	×	31	=	21700
April 1.	Paid,	100				
	Bal.	600	×	30	=	18000
May 1.	Paid,	100				
	Bal.	500	×	31	=	15500
June 1.	Paid,	100				
	Bal.	400	×	30	=	12000
July 1.	Paid,	100				
	Bal.	300	×	31	=	9300
Aug. 1.	Paid,	100				
	Bal.	200	×	31	=	6200
Sept. 1.	Paid,	100				
	Bal.	100	×	30	=	3000
Oct. 1.	Paid,	100	.		.	85700
						9

73000)771300

	£	s.	d.
Interest, . .	£10	11	3$\frac{3}{4}$ $\frac{9}{73}$
Principal, .	100	0	0
Last payment,	£110	11	3$\frac{3}{4}$ $\frac{9}{73}$

(47)

		£		Days.		Dr.
July	17.	To 450	×	167	=	75150
Aug.	15.	To 300	×	138	=	41400
Sept.	4.	To 721	×	118	=	85078
Nov.	11.	To 875	×	50	=	43750
	Dr. products,		.			245378

		£		Days.		Cr.
July	30.	By 340	×	154	=	52360
Sept.	17.	By 693	×	105	=	72765
Oct.	15.	By 960	×	77	=	73920
Nov.	29.	By 123	×	32	=	3936
	Cr. products,		.			202981

42397
9
73000)381573
£5 4 $6\frac{1}{4}\ \frac{1727}{1825}$

(48)

		£		Days.		Dr.
July	5.	To 452	×	179	=	80908
Aug.	25.	To 347	×	128	=	44416
Sept.	11.	To 127	×	111	=	14097
Dec.	17.	To 560	×	14	=	7840
	Dr products,		.			147261

		£		Days.		Cr.
July	13.	By 165	×	171	=	28215
Aug.	1.	By 225	×	152	=	34200
Oct.	10.	By 439	×	82	=	35998
Nov.	3.	By 716	×	58	=	41528
	Cr. products,		.			139941

7300)7320
£1 0 $0\frac{1}{2}\ \frac{46}{73}$

Jamieson & Son in account current with **Alex. Banks.**

Dr. *Cr.*

		£	s.	d.			£	s.	d.
July 5.	To Cash,	452	0	0	July 13.	By Bill,	165	0	0
Aug. 25.	To Goods,	347	0	0	Aug. 1.	By Bill,	225	0	0
Sept. 11.	To Goods,	127	0	0	Oct. 10.	By Bill,	439	0	0
Dec. 17.	To Cash,	560	0	0	Nov. 3.	By Goods,	716	0	0
Dec. 31.	To Int.	1	0	$0\frac{1}{2}$					
Dec. 31.	To Bal.	57	19	$11\frac{1}{2}$					
		1545	0	0			1545	0	0

DISCOUNT.

Page 176.

(1)

Days.

From Feb. 14 to April 1 = 46

Days of grace, . 3

49

	£	s.	d.
∴	739	16	11
			49
7300)	36252	8	11
Discount, . . .	4	19	$3\frac{3}{4}\ \frac{812}{1825}$
Bill, ...	739	16	11
Nett proceeds, . .	£734	17	$7\frac{0}{4}\ \frac{1013}{1825}$

(2)

Days.

From April 4 to June 24 = 81

... ... May 15 = 41

£

∴ 174 × 84 = 14616

1000 × 44 = 44000

1174 58616

8

73000)468928

	£	s.	d.
Discount, ...	£6	8	$5\frac{1}{2}\ \frac{1322}{1825}$
Amount of the bills, . .	1174	0	0
Nett proceeds, . . .	£1167	11	$6\frac{1}{4}\ \frac{503}{1825}$

(3)

Days.

From June 27 to Sept. 14 = 79

... ... Aug. 2 = 36

... ... July 15 = 18

... ... Oct. 3 = 98

£	s.					
∴ 360	0	×	82	=	29520	0
721	0	×	39	=	28119	0
875	10	×	21	=	18385	10
691	15	×	101	=	69866	15
2648	5				145891	5
						8
				73000)	1167130	0

	£	s.	d.
Discount, ...	15	19	$9\frac{0}{4}\ \frac{204}{365}$
Com. on £2648, 5s. at $\frac{1}{2}$ per cent. =	13	4	$9\frac{3}{4}\ \frac{3}{5}$
	29	4	$7\frac{0}{4}\ \frac{58}{365}$
Amount of the bills, ...	2648	5	0
Nett proceeds, ...	£2619	0	$4\frac{3}{4}\ \frac{307}{365}$

TRUE DISCOUNT.

Page 178.

(4)

$$365 : 146 :: \overset{£}{5} : \overset{£}{2}$$

$$\therefore 102 : 100 :: \overset{£}{456}\ \overset{s.}{13} : \overset{£}{447}\ \overset{s.}{13}\ \overset{d.}{11\tfrac{0}{4}}\ \tfrac{4}{7}$$

(5)

$$1 : 2 :: \overset{£}{3\tfrac{1}{2}} : \overset{£}{7}$$

$$\therefore 107 : 100 :: \overset{£}{1000} : \overset{£}{934}\ \overset{s.}{11}\ \overset{d.}{7\tfrac{0}{4}}\ \tfrac{28}{107}$$

(6)

$$12 : 11 :: \overset{£}{4\tfrac{3}{4}} : \overset{£}{\frac{209}{48}}$$

$$\begin{array}{rcrcl} 100\tfrac{209}{48} & : & 100 & :: & \overset{£}{461}\ \overset{s.}{12}\ \overset{d.}{3} : \overset{£}{442}\ \overset{s.}{7}\ \overset{d.}{0\tfrac{1}{4}}\ \tfrac{3487}{5009} \\ 48 & & 48 & & \\ \hline 5009 & & 4800 & & \end{array}$$

(7)

$$365 : 23 :: \overset{£}{4} : \overset{£}{\frac{92}{365}}$$

$$365 : 101 :: 4 : \frac{404}{365}$$

$$365 : 219 :: 4 : 2\tfrac{2}{5}$$

$$\begin{array}{rcrcrcrrl} & & & & £ & & £ & s. & d. \\ \therefore 100\tfrac{92}{365} & : & 100 & :: & 738 & : & 736 & 2 & 10\tfrac{1}{2}\ \tfrac{1674}{2287} \\ 365 & & 365 & & & & & & \\ \hline 36592 & & 36500 & & & & & & \\ 100\tfrac{404}{365} & : & 100 & :: & 276 & : & 272 & 19 & 6\tfrac{3}{4}\ \tfrac{1833}{4613} \\ 365 & & 365 & & & & & & \\ \hline 36904 & & 36500 & & & & & & \\ 102\tfrac{2}{5} & : & 100 & :: & 372 & : & 363 & 5 & 7\tfrac{1}{2} \\ \cline{7-9} 5 & & 5 & & & & £1372 & 8 & 1\tfrac{0}{4}\ \tfrac{11914233}{10549931} \\ \hline 512 & & 500 & & & & & & \end{array}$$

COMMISSION AND BROKERAGE.

Page 180.

(18)

£	s.	d.	
820	14	6	value of woollen stuffs.
327	15	4	" cotton.
120	19	0	" linen.
316	14	9	" silk.
6432	11	5	" other manufactures.
8018	15	0	
		4	
100)32075	0	0	
320	15	0	

				£	s.	d.
(19) Commission on £23514, 16s. 9d. at 5½ per cent. . . . . . . =				1293	6	3¾ $\frac{21}{50}$
Losses, ...	£600	11	3			
Charges attending the business,	117	4	4			
Total charges, . .				717	15	7
Nett income, ...				575	10	8¾ $\frac{21}{50}$

				£	s.	d.
(20) Goods valued at, ...				561	4	10
Charges—						
Package, &c.	£3	15	6			
Shipping charges, . .	5	10	8			
				9	6	2
Commission on £570, 11s. at 2½ per cent.				14	5	3¼ ⅕
Amount of the invoice, £				584	16	3¼ ⅕

				£	s.	d.
(21) Value of the sugar, ...				2750	18	9
Charges—						
Com. on £2750, 18s. 9d. at 2½ per cent.	£68	15	5½ ½			
Brok. on £2750, 18s. 9d. at ½ per cent.	13	15	1$\frac{0}{4}$ ½			
Other charges, . . .	935	7	6			
Total charges, ...				1017	18	0¾
Nett proceeds, . . £				1733	0	8¼

INSURANCE.

Page 182.

		£	s.	d.
(6) Premium on £780 at 1½ guin. per cent.	=	12	5	8¼ ⅗
Duty on £800 at 2s. 6d. per cent. . . .	=	1	0	0
Commission on £780 at ½ per cent.	=	3	18	0
Whole expense,	=	£17	3	8¼ ⅗

		£	s.	d.
(7) Prem. on £1821 at 5½ guin. per cent.	=	105	3	3$\frac{0}{4}$ $\frac{6}{25}$
Com. ... ... ½	=	9	2	1$\frac{0}{4}$ ⅘
Duty on £1900 at 5s. per cent. .	=	4	15	0
Whole expense,	=	£119	0	4¼ $\frac{1}{25}$

		£	s.	d.
(8) Prem. on £2670 at 6¼ guin. per cent.	=	175	4	4½
Com. 〃 〃 ½ 〃 〃 .	=	13	7	0
Duty on £2700 at 5*s.* 3*d.* per cent. .	=	7	1	9
Whole expense, . .	=	£195	13	1½

(9)

	£		
	3587		
	⅛		
100)	447	15	
	4	9	6½ $\frac{2}{5}$
Duty	5	8	0
	£9	17	6½ $\frac{2}{5}$

	£	s.
Duty on £100 =	0	3
		36
〃 £3600 =	£5	8

	£	s.	d.	£	s.	d.					
(10) Premium,	3	3	0	100	0	0					
Policy duty,	0	5	3	3	18	3		£	s.		£
Commission,	0	10	0	£96	1	9	: 100 ::	3074	16	::	3200
Whole expense,	£3	18	3								

	£	s.	d.	£	s.	d.					
(11) Premium,	2	12	6	100	0	0					
Commission,	0	10	0	3	2	6		£	£	s.	d.
	£3	2	6	£96	17	6	: 100 ::	750 :	774	8	10¼ $\frac{25}{31}$

	£	s.	d.	£	s.	d.					
(12) Premium,	4	9	3	100	0	0					
Commission,	0	10	0	4	19	3		£	£	s.	d.
	£4	19	3	£95	0	9	: 100 ::	675 :	710	4	11$\frac{0}{4}$ $\frac{882}{7603}$

	£	s.	d.					
(13)	100	0	0					
	8	7	6		£	£	s.	d.
	£91	12	6	: 100 ::	1000 :	1091	8	1$\frac{0}{4}$ $\frac{716}{733}$

	£	s.					
(14)	100	0					
	5	15		£	£	s.	d.
	£94	5	: 100 ::	1250 :	1326	5	2¼ $\frac{297}{377}$

		£	s.	d.
(15) Brokerage on £316, 9*s.* 9*d.* at ½ per cent.	=	1	11	7¾
Com. on £324, 18*s.* 4¾*d.* at 2 guineas per cent.	=	6	9	11½
Insurance on £350 at 2 guineas per cent.	=	7	7	0
Commission on £350 at ½ per cent. . .	=	1	15	0

	cwt.	qr.	lb.			£	s.	d.
(16)	76	0	22	at £6, 1s. 6d. per cwt.	=	462	17	10¼
	32	1	18	at £6 ...	=	194	9	3¼
	4	1	27	at £5, 17s. ...	=	26	5	5¼

		£	s.	d.
Insurance on £700 at 2½ per cent. . .	=	17	10	0
Freight on 114 cwt. at 7s. 6d. per cwt. . .	=	42	15	0
Commission on £683, 12s. 6¾d. at 2½ per cent.	=	17	1	9¾
Commission on £700 at ½ per cent. . .	=	3	10	0

(17) Invoice of goods shipped on board the *Rawlins*, J. Thomson, master, on account and risk of Messrs James Allan & Co. of Kingston, Jamaica.

No.		£	s.	d.	£	s.	d.
1 to 6	6 puncheons of shoes, as per B. P.				278	15	11
7	1 case linen-tick assorted, as per B. P.				42	0	0
8 to 16	9 bales best tow, do.				236	5	0
17 to 24	8 cases white platillas, do.				328	5	4
25 to 38	14 bales lint, do.				367	10	0
39 to 41	3 cases felt hats, do.				32	2	0
					1284	18	3
	CHARGES.	£	s.	d.			
	Entry, bond, &c. . .	4	8	0			
	Cartage, wharfage, &c. . .	7	9	6			
	Freight and bills of lading,	38	10	6			
	Insurance on £1500 at 2 per cent.	30	0	0			
	Policy duty, ...	3	18	9			
	Commission on £1335 at 5 per cent.	66	15	0			
	Commission on £1500 at ½ per cent.	7	10	0			
					158	11	9
	Errors excepted, £				1443	10	0

HENRY BARCLAY & Co.

London, February 6, 1847.

(18) Account sale of 9 bales of linen, per the *Brothers*, William Salmond, master, from Dublin, for account of Robert Hay, Dublin.

1847.

Date.	No.		£	s.	d.	£	s.	d.
		Sold Whyte & Co.—						
March 23	2	20 pieces, at 23s. 9d. per piece,				23	15	0
	3	15 do. at 24s. 6d. ...				18	7	6
	5	25 do. at 26s. 9d. ...				33	8	9
	8	17 do. at 28s. 3d. ...				24	0	3
		Sold Gordon & Co.—						
April 1	1	23 pieces, at 30s. 6d. per piece,				35	1	6
	4	25 do. at 27s. 9d. ...				34	13	9
	6	30 do. at 30s. 6d. ...				45	15	0
	7	15 do. at 31s. 9d. ...				23	16	3
	9	30 do. at 32s. 6d. ...				48	15	0
		Gross proceeds, . .				287	13	0
		CHARGES.						
		Freight and landwaiter's fees, ...	7	3	9			
		Cartage, porterage, &c.	1	12	4			
		Warehouse rent and insurance against fire, .	0	7	3½			
		Commission on £287 13s. at 5 per cent. . .	14	7	7¾			
		Whole charges, . .				23	11	0¼
		Nett proceeds due to Robert Hay, £				264	1	11¾

JAMES LOWE.

Dundee, April 1, 1847.

PROFIT AND LOSS.

Page 187.

(1) 345 cwt. at 16s. $11\frac{3}{4}$d. = £292 17s. $9\frac{3}{4}$d. P. C.
345 cwt. at 19s. $5\frac{1}{2}$d. = £335 13s. $1\frac{1}{2}$d. S. P.

∴ Gain, . = £42 15 $3\frac{3}{4}$

Or thus,

19s. $5\frac{1}{2}$d. — 16s. $11\frac{3}{4}$d. = 2s. $5\frac{3}{4}$d. = gain per cwt.

∴ 345 at 2s. $5\frac{3}{4}$d. = £42 15s. $3\frac{3}{4}$d. = gain.

(2) 137 cwt. at £1 14s. $9\frac{1}{2}$d. = £238 6s. $5\frac{1}{2}$d. P. C.
15344 lb. at £0 0s. $4\frac{1}{4}$d. = £271 14s. 4d. S. P.

∴ Gain, . = £33 7 $10\frac{1}{2}$

(3) 547 fir. at £2 6s. $10\frac{1}{2}$d. = £1282 0s. $7\frac{1}{2}$d. S. P.
Loss, . = 210 7 4

∴ £1492 7 $11\frac{1}{2}$ P. C.

∴ 547 : 1 : : £1492 7s. $11\frac{1}{2}$d. : £2 14s. $6\frac{3}{4}\frac{193}{547}$d.

(4) 216 gal. at 19s. $3\frac{1}{2}$d. = £208 7s. 0d. P. C.
Loss, . = 11 10 10

∴ £196 16 2 S. P.

∴ 216 : 1 : : £196 16s. 2d. : 18s. $2\frac{1}{2}\frac{19}{27}$d.

(5) $8\frac{1}{2}$ tons at £17 14s. 3d. = £150 11s. $1\frac{1}{2}$d. P. C.
Gain, . = 9

∴ £159 11 $1\frac{1}{2}$ S. P.

∴ 170 : 1 : : £159 11s. $1\frac{1}{2}$d. : 18s. $9\frac{1}{4}\frac{2}{85}$d.

(6)

s. *d.* — £ *s.* *d.*

236 feet at 3 10 = 45 4 8 P. C.

236 feet at 3 $4\frac{1}{4}$ = 39 11 7 S. P.

∴ Loss, . = £5 13 1

Or thus,

s. *d.* *s.* *d.* *d.*

3 10 — 3 $4\frac{1}{4}$ = $5\frac{3}{4}$ = loss per foot.

d. — £ *s.* *d.*

∴ 236 feet at $5\frac{3}{4}$ = 5 13 1

(7)

£ *s.* *d.*

S. P. per yard, = 1 3 7

P. C. ... = 0 18 $4\frac{1}{2}$

∴ Gain, ... = £0 5 $2\frac{1}{2}$

s. *d.* £ *s.* yd. yd. qr. nl.

∴ 5 $2\frac{1}{2}$: 42 10 : : 1 : 163 0 $3\frac{1}{5}$

(8)

£ *s.* *d.*

d.

2 10 0 = P. C. per cwt.

112 lb. at $6\frac{1}{2}$ = 3 0 8 = S. P. ...

∴ £0 10 8 = gain ...

s. *d.* £ cwt. cwt. qr. lb.

10 8 : 123 : : 1 : 230 2 14

(9)

£ *s.* *d.*

s. *d.*

12 11 6 = P. C. per ton.

20 cwt. at 11 8 = 11 13 4 = S. P. ...

∴ £0 18 2 = gain ...

s. *d.* £ ton. ton. cwt. qr. lb.

18 2 : 178 : : 1 : 195 19 1 $1\frac{87}{109}$

(10)

£ *s.* *d.*

3 8 $4\frac{1}{2}$ = S. P. per bar.

3 2 0 = P. C. ...

£0 6 $4\frac{1}{2}$ = gain ...

£ *s.* *s.* *d.* £ £

∴ 3 2 : 6 $4\frac{1}{2}$ :: 100 : $10\frac{35}{124}$

(11)

£ *s.* *d.*

4 11 3 = S. P. per cwt.

3 17 9 = P. C. ...

£0 13 6 = gain ...

£ *s.* *d.* *s.* *d.* £ £

∴ 3 17 9 : 13 6 :: 100 : $17\frac{113}{311}$

(12)

d. : *d.* : : £ : £

12 : $2\frac{1}{4}$: : 100 : $18\frac{3}{4}$

(13)

£ *s.* *d.*

1 19 0 = P. C. per cwt.

1 12 8 = S. P. ...

£0 6 4 = loss ...

£ *s.* : *s.* *d.* : : £ : £

∴ 1 19 : 6 4 : : 100 : $16\frac{28}{117}$

(14)

	£ *s.* *d.*		£ *s.* *d.*	
176 cwt. at	2 5 4	=	398 18 8	
Carriage,	. . .	=	5 7 3	
P. C. of 176 cwt.		=	404 5 11	
19712 lb. at $6\frac{3}{4}$d.	.	=	554 8 0	= S. P.
∴ Gain,	.	=	£150 2 1	

£ *s.* *d.* : £ *s.* *d.* : : £ : £

∴ 404 5 11 : 150 2 1 : : 100 : $37\frac{10133}{97091}$

(15)

s. : *s.* *d.* : : £ : £ *s.* *d.*

20 : 8 $9\frac{3}{4}$: : 100 : 44 1 3

Or thus,

s. *d.* £

8 $9\frac{3}{4}$ = ·440625

100

44·0625 = £44 1 3

(16) 83 : 100 : : £ *s.* *d.* 2 19 7 : £ *s.* *d.* 3 11 $9\frac{1}{4}$ $\frac{65}{83}$

(17) 100 : 125 : : £ *s.* *d.* 5 3 $4\frac{1}{2}$: £ *s.* *d.* 6 9 $2\frac{1}{2}$ $\frac{1}{2}$

(18) 113 : 100 : : £ *s.* *d.* 4 3 10 : £ *s.* *d.* 3 14 $2\frac{1}{4}$ $\frac{7}{113}$

(19) 100 : 130 : : £ 22 : £ *s.* 28 12

(20) $107\frac{1}{2}$: 100 : : £ *s.* *d.* 4 10 6 : £ *s.* *d.* 4 4 $2\frac{0}{4}$ $\frac{40}{43}$

2 2

215 200

(21)

$$\begin{array}{ccccccccc} & & & & s. & d. & & s. & d. \\ 84\frac{3}{4} & : & 100 & :: & 15 & 4 & : & 18 & 1\frac{0}{4}\,\frac{148}{339} \\ 4 & & 4 & & & & & & \\ \hline 339 & & 400 & & & & & & \end{array}$$

$$\begin{array}{l} \qquad\qquad\qquad\qquad\qquad\qquad\quad £ \quad s. \quad d. \\ 456 \text{ bar. at } 2s.\ 9\frac{0}{4}d.\ \frac{148}{339} = 62\ \ 18\ \ 1\frac{3}{4}\,\frac{9}{113} \end{array}$$

$$\overset{s.}{2}\ \ \overset{d.}{9\frac{0}{4}}\,\frac{148}{339} = \frac{\overset{f.}{44896}}{339}$$

$$\therefore \frac{44896 \times 456}{339} = \frac{44896 \times 152}{113} = \frac{\overset{f.}{6824192}}{113} = \overset{f.}{60391}\frac{9}{113}$$

$$= £62,\ 18s.\ 1\tfrac{3}{4}d.\ \tfrac{9}{113}.$$

(22)

$$\begin{array}{cccccccccc} & & & & s. & d. & & £ & s. & d. \\ 100 & : & 124 & :: & 17 & 6\frac{1}{2} & : & 1 & 1 & 9\frac{0}{4}\,\frac{2}{25} \end{array}$$

(23)

$$\overset{£}{25}\ \ \overset{s.}{7} = \overset{s.}{507}$$

$$\begin{array}{ccccc} & & & & s. \\ 120 & : & 100 & : & 507 \\ 84 & : & 1 & & \end{array}$$

$$\frac{100 \times 507}{120 \times 84} = \frac{5 \times 169}{12 \times 14} = \frac{\overset{s.}{845}}{168} = \overset{s.}{5}\ \ \overset{d.}{0\frac{1}{4}}\,\frac{3}{7}$$

(24)

$$\begin{array}{cccccccccc} & & & & £ & s. & & £ & s. & d. \\ 100 & : & 118 & :: & 11 & 10 & : & 13 & 11 & 4\frac{3}{4}\,\frac{1}{5} \end{array}$$

(25)

$$\begin{array}{cccccccccc} & & & & s. & d. & & £ & s. & d. \\ 100 & : & 122\frac{1}{2} & :: & 18 & 6 & : & 1 & 2 & 7\frac{3}{4}\,\frac{4}{5} \\ 2 & & 2 & & & & & & 18 & 6 \\ \hline 200 & & 245 & & & & & & 4 & 1\frac{3}{4}\,\frac{4}{5} \end{array}$$

$$\begin{array}{ccccccccccc} & s. & d. & & £ & s. & d. & & \text{gal.} & & \text{gal.} \\ \therefore & 4 & 1\frac{3}{4}\,\frac{4}{5} & : & 70 & 4 & 8 & : & 1 & : & 337\frac{457}{999} \end{array}$$

(26)

$$\overset{£}{4}\ \ \overset{s.}{10} = \overset{s.}{90};\ \overset{£}{47}\ \ \overset{s.}{14} = \overset{s.}{954}$$

$$\therefore 90 \ :\ 954 \ ::\ \overset{£}{100} \ :\ \overset{£}{1060}$$

(27)
$$6 : 32 :: \overset{\text{£}}{100} : \overset{\text{£}}{\frac{1600}{3}}$$

$$\text{Now, } \overset{s.}{6}\ \ \overset{d.}{6} = \overset{\text{£}}{\frac{78}{240}}$$

$$\therefore \frac{78}{240} : \frac{1600}{3} :: \overset{\text{lb.}}{1}$$

$$\frac{1600}{3} \times \frac{240}{78} = \frac{1600 \times 40}{39} = \frac{64000}{39} = \overset{\text{lb.}}{1641\tfrac{1}{39}}$$

(28)
$$\overset{\text{£}}{3} = \overset{s.}{60};\ \overset{\text{£}}{26}\ \overset{s.}{17} = \overset{s.}{537}$$

$$\begin{array}{lllll} \overset{s.}{60} & : & \overset{s.}{537} & :: & \overset{\text{£}}{100} \\ 342 & : & 1 & & \end{array}$$

$$\frac{537 \times 100}{60 \times 342} = \frac{179 \times 5}{342} = \overset{\text{£}}{\frac{895}{342}} = \overset{\text{£}}{2}\ \overset{s.}{12}\ \overset{d.}{4\tfrac{0}{4}\tfrac{16}{57}}$$

$$\begin{array}{lllll} 60 & : & 537 & :: & \overset{\text{£}}{103} \\ 342 & : & 1 & & \end{array}$$

$$\frac{537 \times 103}{60 \times 342} = \frac{179 \times 103}{20 \times 342} = \overset{\text{£}}{\frac{18437}{6840}} = \overset{\text{£}}{2}\ \overset{s.}{13}\ \overset{d.}{10\tfrac{3}{4}\tfrac{37}{57}}$$

(29)
$$\overset{\text{£}}{3}\ \overset{s.}{10} = \overset{d.}{840};\ \overset{\text{£}}{37}\ \overset{s.}{4}\ \overset{d.}{2} = \overset{d.}{8930}$$

$$\begin{array}{lllll} 840 & : & 8930 & :: & \overset{\text{£}}{100} \\ 782 & : & 1 & & \end{array}$$

$$\frac{8930 \times 100}{840 \times 782} = \frac{4465 \times 5}{21 \times 782} = \overset{\text{£}}{\frac{22325}{16422}} = \overset{\text{£}}{1}\ \overset{s.}{7}\ \overset{d.}{2\tfrac{1}{4}\tfrac{215}{2737}}$$

$$\begin{array}{lllll} 840 & : & 8930 & :: & \overset{\text{£}}{96}\ \overset{s.}{10} \\ 782 & : & 1 & & \underline{\ \ 20} \\ & & & & 1930 \end{array}$$

$$\frac{8930 \times 1930}{840 \times 782} = \frac{4465 \times 193}{42 \times 782} = \overset{s.}{\frac{861745}{32844}} = \overset{\text{£}}{1}\ \overset{s.}{6}\ \overset{d.}{2\tfrac{3}{4}\tfrac{1097}{2737}}$$

(30)
£ £ s. £ £ s.
5 : 73 10 :: 105 : 1543 10

£ s. £ s. cwt. cwt. qr. lb.
$\therefore$ 2 19 : 1543 10 :: 1 : 523 0 $24\frac{40}{59}$

(31)
£ s. d. £ s. d. d.
32 15 = 7860; 30 15 6 = 7386

£ £ s. d.
7860 : 7386 :: 115 : 108 1 $3\frac{1}{2}\frac{38}{131}$
100 0 0
£8 1 $3\frac{1}{2}\frac{38}{131}$

(32)
s. s. d.
84 : 107 :: 8 : 10 $2\frac{1}{4}\frac{1}{7}$

(33)
£ s. d. d. £ s. d.
4 4 6 = 1014; 4 9 = 1068

£ £ s. d.
1014 : 1068 :: 117 : 123 4 $7\frac{1}{4}\frac{7}{13}$
100 0 0
£23 4 $7\frac{1}{4}\frac{7}{13}$

(34)
£ s. s.
125 10 = 2510

s.
786 : 1 :: 2510
108 : 116

$$\frac{116 \times 2510}{736 \times 108} = \frac{29 \times 1255}{92 \times 108} = \frac{36395}{9936}\text{ s.} = 3\text{ s. } 7\tfrac{3}{4}\tfrac{179}{207}\text{ d.}$$

(35)
£ s. d. £ s. d. d.
1 10 = 360; 1 2 6 = 270

£ £ s.
360 : 270 :: 114 : 85 10
100
Loss = £14 10

MISCELLANEOUS EXERCISES.

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(1)

		£	s.	d.
7428 at 12s. 3d.	=	4549	13	0
1857 at 13s. 9d.	=	1276	13	9
1857 at 14s. 2d.	=	1315	7	6
1857 at 14s. 7½d.	=	1357	18	7½
1857 at 15s. 10¼d.	=	1472	1	2¼
Money received, .	=	£5422	1	0¾
Money laid out, . .	=	4549	13	0
∴ Gain, . . .	=	£872	8	0¾

£ 4549 s. 13 : £ 872 s. 8 d. 0¾ : : £ 100 : £ 19 s. 3 d. 6$\frac{0}{4}$ $\frac{8}{45}$

(2)

108 : 126 : : £ 56 s. 17 d. 6
314 : 1

$$\frac{126 \times 13650}{108 \times 314} = \frac{7 \times 2275}{314} = \frac{15925}{314} \text{ d.}$$

$= 50\frac{1}{2}\frac{136}{157}$ d. $= 4s.\ 2\frac{1}{2}d.\ \frac{136}{157}$

(3)

£ 3 s. 1 d. 6 — £ 2 s. 14 d. 0 = s. 7 d. 6

∴ 236 cwt. at 7s. 6d. = £ 88 s. 10

£ 2 s. 14 : s. 7 d. 6 : : £ 100 : £ 13 s. 17 d. 9¼ ⅓

(4)

46 . 50 : : £ 90 : £ 97 s. 16 d. 6¼ $\frac{1}{23}$

	£	s.	d.
	100		
Loss, . .	£2	3	5½ $\frac{22}{23}$

(5)

		£.	s.	d.
718 cwt. at £5 16s. 8d.	=	4188	6	8
40208 lb. at 1s. 4d.	=	2680	10	8
40208 lb. at 1s. 6d.	=	3015	12	0
Money received,	=	£5696	2	8
Money laid out,	=	4188	6	8
∴ Gain, . .	=	£1507	16	0

£ 4188 s. 6 d. 8 : £ 1507 s. 16 : . £ 100 : £ 36

(6)

		£	s.	d.
80 casks at £27, 10s.	=	2200	0	0
Gain, . .	=	200	0	0
	20160)	2400	0	0
		£0	2	$4\frac{1}{2}\ \frac{2}{7}$

(7)

		£	s.
252 gal. at 17s. 4d.	=	218	8
12 gal. leakage.			
240 gal.			

$$\therefore \begin{array}{l} 100 : 115 : \overset{s.}{4368} \\ 240 : \quad 1 \end{array}$$

$$\frac{115 \times 4368}{100 \times 240} = \frac{23 \times 273}{20 \times 15} = \frac{\overset{s.}{6279}}{300} = \overset{s.}{20}\ \overset{d.}{11\frac{0}{4}}\ \frac{16}{25}$$

(8)

$$\begin{array}{l} 100 : 120 :: \overset{s.}{8} \\ 200 : 205 \end{array}$$

$$\frac{120 \times 205 \times 8}{100 \times 200} = \frac{6 \times 41}{5 \times 5} = \frac{\overset{s.}{246}}{25} = \overset{s.}{9}\ \overset{d.}{10\frac{0}{4}}\ \frac{8}{25}$$

(9)

		£	s.	d.
4914 lb. at 3s. 4½d.	=	829	4	9
Various charges,	=	10	17	9
Money laid out,	=	£840	2	6
1726 lb. at 5s. 1d.	=	438	13	10
1271 lb. at 4s. 3½d.	=	272	14	8½
1917 lb. at 2s. 9½d.	=	267	11	7½
Money received, . .		£979	0	2
		840	2	6
∴ Gain, . .	=	£138	17	8

(10)

		£	s.	d.
11 pipes at £31, 10s.	=	346	10	0
572 dozen bottles at 2s. 4d.	=	66	14	8
Money laid out, .	=	£413	4	8
286 doz. at 16s. 2d.	=	231	3	8
286 doz. at 17s. .	=	243	2	0
Money received, .	=	£474	5	8
		413	4	8
∴ Gain, . . .	=	£61	1	0

(11)

		£	s.	d.
400 chal. at £5, 10s. . .	=	2200	0	0
Rent, ...	=	25	0	0
Servants' wages, . .	=	60	0	0
Duty on 16000 bush. at 2s. 7d.	=	2066	13	4
Sum laid out, . . .	=	£4351	13	4

£ s. d.
∴ 100 : 120 : : 4351 13 4
16000 : 1

$$\frac{120 \times 1044400}{100 \times 16000} = \frac{3 \times 2611}{5 \times 20} = \overset{d.}{\frac{7833}{100}} = \overset{d.}{78\tfrac{1}{4}}\ \tfrac{8}{25}$$

$$= \overset{s.}{6}\quad \overset{d.}{6\tfrac{1}{4}}\ \tfrac{8}{25}$$

(12) 100 : 97 : : 1800 qr. : 1746 qr.

		£	s.	d.
1800 qr. at 47s. 6d. . .	=	4275	0	0
Granary rent, ...	=	17	0	0
Duty on 1746 qr. at 4s. . .	=	349	4	0
Interest on £4275 for 8 mo. at 5 per cent.	=	142	10	0
Prime cost, ...		4783	14	0
1746 qr. at 64s. 3d. . .	=	5609	0	6
∴ Gain, ...	=	£825	6	6

(13) 100 : 125 : : £1 12s. : £2

£2 — £1 12s. = 8s. gain on 1 cwt.

∴ 8s. : £100 : : 1 cwt. : 250 cwt.

SHARES, STOCKS.

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(1)

$$91\tfrac{1}{8} + \tfrac{1}{8} = 91\tfrac{1}{4}$$

$$\begin{array}{llllllll} & & & & \pounds & & \pounds & s. \\ \therefore & 100 & : & 1500 \;\; :: & 91\tfrac{1}{4} & : & 1368 & 15 \end{array}$$

(2)

$$96\tfrac{1}{4} - \tfrac{1}{8} = 96\tfrac{1}{8}$$

$$\begin{array}{lllllllllll} & & & & \pounds & s. & d. & & \pounds & s. & d. \\ \therefore & 100 & : & 2100 \;\; :: & 96 & 2 & 6 & : & 2018 & 12 & 6 \end{array}$$

(3)

$$\frac{50 \times 7}{72\tfrac{1}{8}} = 4\tfrac{492}{577}$$

(4)

$$95\tfrac{7}{8} + \tfrac{1}{8} = 96$$

$$\begin{array}{llllllllllll} & \pounds & & \pounds & s. & d. & & \pounds & & \pounds & s. & d. \\ \therefore & 96 & : & 7733 & 6 & 8 & : & 3 & : & 241 & 13 & 4 \end{array}$$

(5)

$$99\tfrac{7}{8} - 91\tfrac{5}{8} = 8\tfrac{1}{4} = \text{gain on } 100$$

$$\begin{array}{llllllll} & & & & \pounds & & \pounds & s. \\ \therefore & 100 & : & 2500 \;\; :: & 8\tfrac{1}{4} & : & 206 & 5 \end{array}$$

(6)

$$92\tfrac{4}{8} + \tfrac{1}{8} = 92\tfrac{5}{8}\,;\; 94\tfrac{6}{8} + \tfrac{1}{8} = 94\tfrac{7}{8}$$

$$\begin{array}{lllllllllll} & & & \pounds & s. & d. & & \pounds & & \pounds & s. \\ \therefore & 92\tfrac{5}{8} & : & 2593 & 10 & 0 & : & 3 & : & 84 & 0 \\ & 94\tfrac{7}{8} & : & 2941 & 2 & 6 & : & 3\tfrac{1}{4} & : & 100 & 15 \\ \hline & & & & & & & & & \pounds 16 & 15 \end{array}$$

(7)
$$\overset{\pounds}{100} : \overset{\pounds}{8000} :: 93\tfrac{1}{2} : 93\tfrac{1}{2} \times 80 = \pounds 7480$$
$$93\tfrac{1}{2} : 100 :: 3 : \pounds 3,\ 4s.\ 2d.\tfrac{10}{187}$$

(8)
$$3\overline{)\overset{\pounds}{93} : \overset{\pounds}{2400}} :: \overset{\pounds}{100} : \overset{\pounds}{2580\tfrac{20}{31}}$$
$$31 : 800$$
$$\begin{array}{r} 100 \\ \hline 31\overline{)80000} \\ \hline 2580\tfrac{20}{31} \end{array}$$
$$\overset{\pounds}{100} : \overset{\pounds}{2580\tfrac{10}{31}} :: \overset{\pounds}{3\tfrac{1}{2}}$$
$$3100 : 80000 :: 3\tfrac{1}{2} : \frac{280000}{3100} = \pounds 90\tfrac{10}{31}$$

(9)
$$18\overline{)\overset{\pounds}{90} : \overset{\pounds}{72}} :: \overset{\pounds}{1500} : \frac{1500 \times 4}{5} = \overset{\pounds}{1200}$$
$$5 : 4$$

(10)
$$\overset{\pounds}{100} : \overset{\pounds}{4590} :: \overset{\pounds}{3\tfrac{1}{2}} : \overset{\pounds}{160}\ \overset{s.}{13} = \text{income before transfer}$$
$$\overset{\pounds}{85} : \overset{\pounds}{93} :: \overset{\pounds}{4590} : \overset{\pounds}{5022} = \text{stock purchased}$$
$$\overset{\pounds}{100} : \overset{\pounds}{5022} :: \overset{\pounds}{3} : \overset{\pounds}{150}\ \overset{s.}{13}\ \overset{d.}{2\tfrac{1}{4}}\ \tfrac{3}{5} = \text{income after transfer;}$$
$$\therefore \text{the loss} = \overset{\pounds}{160}\ \overset{s.}{13} - \overset{\pounds}{150}\ \overset{s.}{13}\ \overset{d.}{2\tfrac{1}{4}}\ \tfrac{3}{5} = \overset{\pounds}{9}\ \overset{s.}{19}\ \overset{d.}{9\tfrac{1}{2}}\ \tfrac{2}{5}$$

(11)
$$\overset{\pounds}{100} : \overset{\pounds}{5000} :: (98 - \tfrac{1}{8} = 97\tfrac{7}{8}) : \overset{\pounds}{4893}\ \overset{s.}{15} = \text{sum received}$$
$$95\tfrac{3}{4} + \tfrac{1}{8} = \overset{\pounds}{95\tfrac{7}{8}} : \overset{\pounds}{4893\tfrac{3}{4}} :: \overset{\pounds}{3} : \overset{\pounds}{153}\ \overset{s.}{2}\ \overset{d.}{6\tfrac{3}{4}}\ \tfrac{699}{767}.\ \text{Income.}$$

(12)
$$\overset{\pounds}{600} \times 27 = \overset{\pounds}{16200} = \text{the cost}$$
$$\overset{\pounds}{95} : \overset{\pounds}{16200} :: \overset{\pounds}{100} : \overset{\pounds}{17052\tfrac{12}{19}} = \text{stock}$$
$$\overset{\pounds}{16200} : \overset{\pounds}{100} :: 600 : \overset{\pounds}{3\tfrac{57}{81}}$$
$$\overset{\pounds}{95} : \overset{\pounds}{100} :: 3 : 3\tfrac{3}{19}$$
$$3\tfrac{57}{81} - 3\tfrac{3}{19} = 3\tfrac{1083}{1539} - 3\tfrac{243}{1539} = \overset{\pounds}{\tfrac{840}{1539}}.$$

PARTNERSHIP.

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(1)

		£
A's share		700
B's	〃	350
C's	〃	1000
Total capital	=	£2050

				£		£	s.	d.
2050	:	700	::	500	:	170	14	$7\frac{1}{2}\,\frac{18}{41}$
2050	:	350	::	500	:	85	7	$3\frac{3}{4}\,\frac{9}{41}$
2050	:	1000	::	500	:	243	18	$0\frac{1}{2}\,\frac{14}{41}$

Total profit = £500 0 0 proof.

(2) A + B + C + D's shares = 6 + 5 + 3 + 4 = 18 total shares.

				£	s.	d.		£	s.	d.		
18	:	6	::	364	17	6	:	121	12	6	=	A's share.
18	:	5	::	364	17	6	:	101	7	1	=	B's 〃
18	:	3	::	364	17	6	:	60	16	3	=	C's 〃
18	:	4	::	364	17	6	:	81	1	8	=	D's 〃

(3)

	£
Sum insured by the first underwriter, . .	450
〃 〃 second 〃 . .	700
〃 〃 third 〃 . .	350
〃 〃 fourth 〃 . .	900
Sum at the risk of the owners, . . .	600
Total sum . . . . =	£3000

				£	s.	d.		£	s.	d.
3000	:	450	::	375	14	10	:	56	7	$2\frac{1}{2}\,\frac{4}{5}$
3000	:	700	::	375	14	10	:	87	13	$5\frac{1}{2}\,\frac{2}{15}$
3000	:	350	::	375	14	10	:	43	16	$8\frac{3}{4}\,\frac{1}{15}$
3000	:	900	::	375	14	10	:	112	14	$5\frac{1}{4}\,\frac{3}{5}$
3000	:	*600*	::	375	14	10	:	75	2	$11\frac{1}{2}\,\frac{2}{5}$

Total loss . = £375 14 10 proof.

(4)

	£	s.	d.		£	s.	d.
Debt due to A =	115	16	0	× ¾ =	86	17	0
" " B =	105	0	0	× ¾ =	78	15	0
" " C =	93	11	5	× ¾ =	70	8	6¾
" " D =	71	5	6	× ¾ =	53	9	1½
" " E =	36	14	7	× ¾ =	27	10	11¼
" " F =	15	15	0	× ¾ =	11	16	3
" " G =	0	11	6	× ¾ =	0	8	7½
Total debt =	£438	14	0		£329	0	6 proof.

£ s. £ s. £ s. d.
438 14 : 115 16 :: 329 0 6

Here it will be found that the first term is to the third as 4 is to 3, and therefore each individual will receive ¾ of the sum due; the answers can therefore be got by multiplying each of the sums due by ¾, as shewn above.

(5)

	£
A's rent =	2300
B's " =	1500
C's " =	1200
D's " =	970
Total rent =	£5970

		ac.	ac.	ro.	po.
5970 : 2300	::	1000 :	385	1	1 323/597
5970 : 1500	::	1000 :	251	1	1 1/199
5970 : 1200	::	1000 :	201	0	0 160/199
5970 : 970	::	1000 :	162	1	36 388/597

(6)

L's gain =	125,	and 125 × 7 =	875	L's stock.
M's " =	240	" 240 × 7 =	1680	M's "
N's " =	135	" 135 × 7 =	945	N's "
Total " =	500		£3500	proof.

£
500 : 125 :: 3500 : L's stock.

Here the third term of the proportion is 7 times the first, and hence each man's stock was 7 times his gain.

(7)

	£
A's stock =	4000
B's " =	2140
C's " =	2760
Total =	8900

	£	s.	d.
Total gain . . =	1483	6	8
C's salary . . =	445	0	0
Remaining profit =	1038	6	8

		£	s.	d.		£	s.	d.	
8900 : 4000	::	1038	6	8	:	466	13	4	= A's gain.
8900 : 2140	::	1038	6	8	:	249	13	4	= B's "
8900 : 2760	::	1038	6	8	:	322	0	0	= C's "
						445	0	0	= C's salary.
						£767	0	0	= C's share.

(8) $8 + 1 = 9$

lb. lb.

9 : 8 :: 10 : $8\frac{8}{9}$ = oxygen.

9 : 1 :: 10 : $1\frac{1}{9}$ = hydrogen.

(9) £9360 : £1 :: £8190 : 17s. 6d. = the sum per £1;

∴ A would receive 17s. 6d. × 875 = £765 12s. 6d.

(10)

	£		mo.		
A	340	×	4	=	1360
B	510	×	8	=	4080
C	850	×	10	=	8500
Total products				=	13940

		£	s.	d.		£	s.	d.
13940 : 1360	::	270	13	6	:	26	8	$1\frac{3}{4}\frac{1}{41}$
13940 : 4080	::	270	13	6	:	79	4	$5\frac{1}{4}\frac{3}{41}$
13940 : 8500	::	270	13	6	:	165	0	$10\frac{3}{4}\frac{37}{41}$

In the above proportions it will be found that the first and second terms of each are divisible by 340, and dividing, they become 41 : 4, 41 : 12, and 41 : 25, which greatly simplifies the calculation.

(11)

	£		mo.		
A	760	×	5	=	3800
B	870	×	8	=	6960
C	770	×	12	=	9240
Total products				=	20000

		£	s.	d.		£	s.	d.
20000 : 3800	::	520	18	10	:	98	19	$6\frac{3}{4}\frac{19}{25}$
20000 : 6960	::	520	18	10	:	181	5	$9\frac{0}{4}\frac{24}{125}$
20000 : 9240	::	520	18	10	:	240	13	$6\frac{0}{4}\frac{6}{125}$

(12)

$$\begin{array}{lrcrcrcrcr} & \text{£} & & \text{years.} & & & & & & \text{ratios.} \\ \text{A} & 960 & \times & 2 & = & 1920 & \div & 120 & = & 16 \\ \text{B} & 1500 & \times & 2 & = & 3000 & \div & 120 & = & 25 \\ \text{C} & 720 & \times & 1\frac{1}{3} & = & \underline{960} & \div & 120 & = & \underline{8} \\ \multicolumn{4}{l}{\text{Total products}} & = & 5880 & \div & 120 & = & 49 \end{array}$$

$$\begin{array}{rcrcrrcrrl} & & & & \text{£} & s. & & \text{£} & s. & d. \\ 49 & : & 16 & :: & 847 & 15 & : & 276 & 16 & 3\frac{3}{4}\,\frac{33}{49} \\ 49 & : & 25 & :: & 847 & 15 & : & 432 & 10 & 6\frac{0}{4}\,\frac{24}{49} \\ 49 & : & 8 & :: & 847 & 15 & : & 138 & 8 & 1\frac{3}{4}\,\frac{41}{49} \end{array}$$

(13)

30 acres at £9, 10*s.* = £285.

$$\begin{array}{lrcrcrcrcr} & \text{oxen.} & & \text{mo.} & & & & & & \text{ratios.} \\ \text{A} & 40 & \times & 2 & = & 80 & \div & 10 & = & 8 \\ \text{B} & 30 & \times & 1 & = & 30 & \div & 10 & = & 3 \\ \text{C} & 35 & \times & 4 & = & 140 & \div & 10 & = & 14 \\ \text{D} & 20 & \times & 5 & = & \underline{100} & \div & 10 & = & \underline{10} \\ \multicolumn{4}{l}{\text{Total products}} & = & 350 & \div & 10 & = & 35 \end{array}$$

$$\begin{array}{rcrcrcrrlcl} & & & & \text{£} & & \text{£} & s. & d. & & \\ 35 & : & 8 & :: & 285 & : & 65 & 2 & 10\frac{1}{4}\,\frac{1}{7} & = & \text{A's portion.} \\ 35 & : & 3 & :: & 285 & : & 24 & 8 & 6\frac{3}{4}\,\frac{3}{7} & = & \text{B's} \quad '' \\ 35 & : & 14 & :: & 285 & : & 114 & 0 & 0 & = & \text{C's} \quad '' \\ 35 & : & 10 & :: & 285 & : & 81 & 8 & 6\frac{3}{4}\,\frac{3}{7} & = & \text{D's} \quad '' \end{array}$$

(14)

$$\begin{array}{ll} & \begin{array}{rcr} \text{£} & & \text{mo.} \end{array} \hspace{14em} \text{ratios.} \\ \text{A} & \left.\begin{array}{rcr} 700 & \times & 24 \\ 250 & \times & 16 \end{array}\right\} = 20800 \div 100 = 208 \\ \text{B} & \left.\begin{array}{rcr} 650 & \times & 15 \\ 350 & \times & 9 \end{array}\right\} = 12900 \div 100 = 129 \\ \text{C} & \left.\begin{array}{rcr} 850 & \times & 10 \\ 1250 & \times & 8 \\ 350 & \times & 6 \end{array}\right\} = 20600 \div 100 = 206 \\ \multicolumn{2}{l}{\text{Total products} \quad = 54300 \div 100 = 543} \end{array}$$

$$\begin{array}{rcrcrrcrrl} & & & & \text{£} & s. & & \text{£} & s. & d. \\ 543 & : & 208 & :: & 1684 & 12 & : & 645 & 5 & 11\frac{1}{2}\,\frac{10}{181} \\ 543 & : & 129 & :: & 1684 & 12 & : & 400 & 4 & 2\frac{0}{4}\,\frac{88}{181} \\ 543 & : & 206 & :: & 1684 & 12 & : & 639 & 1 & 10\frac{1}{4}\,\frac{83}{181} \end{array}$$

EQUATION OF PAYMENTS.

Page 202.

(1)

£		Days.		Products.
56	×	40	=	2240
72	×	108	=	7776
106	×	175	=	18550
230	×	241	=	55430
960	×	342	=	328320
£1424				)412316
				289 $\frac{195}{356}$

(2)

£		Mo.		Products.
100	×	2	=	200
750	×	7	=	5250
£850				)5450
				6$\frac{7}{17}$

(3)

£		Yr.		Products.
250	×	1	=	250
560	×	1$\frac{1}{2}$	=	840
490	×	2	=	980
1000	×	3$\frac{1}{2}$	=	3500
£2300				)5570
				2$\frac{97}{230}$

(4)

£		Mo.		Products.
300	×	4	=	1200
125	×	5	=	625
365	×	8	=	2920
400	×	10	=	4000
560	×	12	=	6720
£1750				)15465
				8$\frac{293}{350}$

(5)

	£		Days.		Products.
Feb. 2,	350				
May 15,	675	×	102	=	68850
Aug. 1,	482	×	180	=	86760
Nov. 11,	1000	×	282	=	282000
	£2507				)437610
					174$\frac{1392}{2507}$

(6)

	£		Days.		Products.
Feb. 1,	780				
Mar. 25,	610	×	52	=	31720
May 15,	320	×	103	=	32960
	£1710				)64680
					37$\frac{47}{57}$

(7)

	£		Days.		Products.
Mar. 25,	1				
June 24,	1	×	91	=	91
Sep. 29,	1	×	188	=	188
Dec. 25,	1	×	275	=	275
	£4				)554
					138$\frac{1}{2}$

AVERAGE.

Page 203.

```
          £      s.  d.     |  (2)      49·10
(1)   44261      0   4      |           40·06
      47471     14   5      |           39·00
      38006      5  11      |           27·20
    3)129739     0   8      |           28·00
     £43246      6  10½ ⅔   |           21·50
                            |         6)204·86
                            |           34·14 +
```

```
      yr.   mo.  |        d.   |             s.
(3)   14    3    |  (4)   8    |  (5)  1 at 2s. =  2
      13   11    |        7½   |       2 at 4s. =  8
      13    1    |        7¼   |       2 at 5s. = 10
      12    0    |        6¾   |       7 at 8s. = 56
      12    6    |      4)29½  |               12)76
      11    9    |        7¼ ½ |                  6s. 4d.
    6)77    6    |             |
      12   11    |             |
```

DIVIDEND.

Page 204.

```
           £   s.    |          £   s.
(1)  1000)800  0     |   (2)   300  0
            0 16     |         400 10
                     |         620 15
                     |         150 15    £
                     |        1472    )  184
                     |                    20  s.  d.
                     |                  3680 (2   6
                     |                  2944
                     |                   736
                     |                    12
                     |                  8832
                     |                  8832
```

BARTER.

Page 205.

£ s. d.
(1) 100506 lb. of sugar at $6\frac{3}{4}$d. = 2826 14 $7\frac{1}{2}$

£ s. d. £ s. d. cwt. cwt.
∴ 7 9 $6\frac{3}{4}$: 2826 14 $7\frac{1}{2}$: : 1 : 378

£ s.
(2) 714 lb. of snuff at 4s. 6d. = 160 13

£ s. £ s. cwt. cwt. qr. lb.
∴ 5 5 : 160 13 : : 1 : 30 2 $11\frac{1}{2}$

£ s. d.
(3) 172 yd. of cloth at £1, 2s. 8d. = 194 18 8

£ s. d. s. d.
∴ 688 : 1 : : 194 18 8 : 5 8

It may be observed, that for 1 yard of cloth we receive 4 pair of stockings, ∴ £1, 2s. 8d. is the price of 4 pair of stockings, ∴ 5s. 8d. is the value of 1 pair.

(4)

£ s. d. s. d. £ s. d. lb. lb.
$31\frac{1}{4}$ yd. at 5s. 6d. = 8 11 $10\frac{1}{2}$, ∴ 1 3 : 38 9 $10\frac{1}{2}$ :: 1 : $615\frac{9}{10}$
78 yd. at 7s. 8d. = 29 18 0

Value of the wool, = £38 9 $10\frac{1}{2}$

£ s. d.
(5) 1200 yd. cambric at 7s. $4\frac{1}{2}$d. = 442 10 0
274 pieces calico at 9s. 4d. = 127 17 4

Value of the lint, = £314 12 8

s. £ s. d. stone. stones.
∴ 15 : 314 12 8 : : 1 : $419\frac{23}{45}$

(6)

		£	s.	d.
120 gal. of rum at 18s. 4d.	=	110	0	0
76 gal. brandy at 17s. 9d.	=	67	9	0
		177	9	0
By cash, ...		8	3	7
Value of the cotton,	=	£169	5	5

∴	12500	:	1	::	£ 169	s. 5	d. 5	:	d. $3\frac{1}{4}$

(7)

		£	s.	d.
192 hats at 11s. 10d.	=	113	12	0
By cash, . .	=	63	0	0
	750)	50	12	0
		£0	1	$4\frac{0}{4}\frac{96}{125}$

(8)

		£	s.	d.
67 cwt. of tobacco at £8, 8s.	=	562	16	0
600 lb. of tea at 7s. 4d.	=	220	0	0
∴ Value of the stockings,	=	£342	16	0

∴	s. 2	d. 8	:	£ 342	s. 16	::	pair. 1	:	pairs. 2571

SCALES OF NOTATION.

Page 207.

(1)

2)2319	7)2319	9)2319
2)1159 r 1	7)331 r 2	9)257 r 6
2)579 r 1	7)47 r 2	9)28 r 5
2)289 r 1	6 r 5	3 r 1
2)144 r 1		
2)72 r 0		
2)36 r 0		
2)18 r 0		
2)9 r 0		
2)4 r 1		
2)2 r 0		
1 r 0		

hence $2319_{10} = 100100001111_2 = 6522_7 = 3156_9$

(2)

$$\begin{array}{r l}
6)\underline{59872} & \\
6)\underline{9978} & r\ 4 \\
6)\underline{1663} & r\ 0 \\
6)\underline{277} & r\ 1 \\
6)\underline{46} & r\ 1 \\
6)\underline{7} & r\ 4 \\
1 & r\ 1
\end{array}
\qquad
\begin{array}{r l}
5)\underline{59872} & \\
5)\underline{11974} & r\ 2 \\
5)\underline{2394} & r\ 4 \\
5)\underline{478} & r\ 4 \\
5)\underline{95} & r\ 3 \\
5)\underline{19} & r\ 0 \\
3 & r\ 4
\end{array}
\qquad
\begin{array}{r l}
12)\underline{59872} & \\
12)\underline{4989} & r\ 4 \\
12)\underline{415} & r\ 9 \\
12)\underline{34} & r\ 7 \\
2 & r\ a
\end{array}$$

$$\therefore\ 59872_{10} = 1141104_6 = 3403442_5 = 2a794_{12}$$

(3)

$$\begin{array}{r}
31476 \\
\underline{9} \\
28 \\
\underline{9} \\
256 \\
\underline{9} \\
2311 \\
\underline{9} \\
20805
\end{array}
\qquad
\begin{array}{r}
8196 \\
\underline{12} \\
97 \\
\underline{12} \\
1173 \\
\underline{12} \\
14082
\end{array}
\qquad
\begin{array}{r}
2503 \\
\underline{6} \\
17 \\
\underline{6} \\
102 \\
\underline{6} \\
615
\end{array}$$

(4)

$$\begin{array}{r}
111022 \\
\underline{5} \\
6 \\
\underline{5} \\
31 \\
\underline{5} \\
155 \\
\underline{5} \\
777 \\
\underline{5} \\
3887
\end{array}
\qquad
\begin{array}{r}
607 \\
\underline{8} \\
48 \\
\underline{8} \\
391
\end{array}$$

(5)

$$\begin{array}{r c r}
372_{10} & = & 1041_7 \\
5834_{10} & = & 23003_7 \\
7936_{10} & = & \underline{32065_7} \\
 & & 56142_7
\end{array}$$

(6)

$$\begin{array}{r c r}
39572_{10} & = & 503112_6 \\
16935_{10} & = & \underline{210223_6} \\
 & & 252445_6
\end{array}$$

(7)

$$\begin{array}{r c r}
18394_{10} & = & 27207_9 \\
375_{10} & = & \underline{456_9} \\
 & & 177346 \\
 & & 150138 \\
 & & \underline{121831} \\
 & & 13872836_9
\end{array}$$

(8)

$$\begin{array}{rcl}
314159_{10} & = & 40023114_5\\
712_{10} & = & 10322_5
\end{array}$$

$$\begin{array}{r}
10322_5)40023114_5(3231_5\\
\underline{32021}\\
30021\\
\underline{21144}\\
33221\\
\underline{32021}\\
12004\\
\underline{10322}\\
\tfrac{1132}{10322}
\end{array}$$

(9)

$$\begin{array}{rcl}
76428_{10} & = & 38290_{12}\\
374_9 & = & 21a_{12}
\end{array}$$

$$\begin{array}{rl}
\underline{9} & \\
34 & \\
\underline{9} & \\
12)\underline{310} & \\
12)\underline{25} & \text{„}\ a\\
2 & \text{„}\ 1
\end{array}$$

$$\begin{array}{r}
38290_{12}\\
\underline{21a_{12}}\\
30a360\\
38290\\
\underline{74560}\\
7b27060_{12}
\end{array}$$

(10)

$$\begin{array}{rcl}
47683_{10} & = & 1004431_6\\
2130_4 & = & 420_6
\end{array}$$

$$\begin{array}{rl}
\underline{4} & \\
9 & \\
\underline{4} & \\
39 & \\
\underline{4} & \\
6)\underline{156} & \\
6)\underline{26} & \text{„}\ 0\\
4 & \text{„}\ 2
\end{array}$$

$$\begin{array}{r}
420_6)1004431_6(1225_6\\
\underline{420}\\
1444\\
\underline{1240}\\
2043\\
\underline{1240}\\
4031\\
\underline{3340}\\
\tfrac{251}{420}
\end{array}$$

(11)

$$\begin{array}{rl}
54230_6 & \\
\underline{6} & \\
34 & \\
\underline{6} & \\
206 & \\
\underline{6} & \\
1239 & \\
\underline{6} & \\
5)\underline{7434} & \\
5)\underline{1486} & \text{„}\ 4\\
5)\underline{297} & \text{„}\ 1\\
5)\underline{59} & \text{„}\ 2\\
5)\underline{11} & \text{„}\ 4\\
2 & \text{„}\ 1
\end{array}
\qquad
\begin{array}{rl}
7213_8 & \\
\underline{8} & \\
58 & \\
\underline{8} & \\
465 & \\
\underline{8} & \\
5)\underline{3723} & \\
5)\underline{744} & \text{„}\ 3\\
5)\underline{148} & \text{„}\ 4\\
5)\underline{29} & \text{„}\ 3\\
5)\underline{5} & \text{„}\ 4\\
1 & \text{„}\ 0
\end{array}$$

$$\begin{array}{rcl}
\therefore\ 54230_6 & = & 214214_5\\
7213_8 & = & \underline{104343_5}\\
\text{Sum} & = & 324112_5\\
\text{Diff.} & = & 104321_5
\end{array}$$

INVOLUTION.

Page 211.

(13) $62^2 = 3844$

(14) $102^2 = \overset{\text{sq. ft.}}{10404} = \overset{\text{sq. in.}}{1498176}; \; 9^2 = \overset{\text{sq. in.}}{81}$

$$\therefore \frac{1498176}{81} = 18496 = \text{number of bricks.}$$

(15) $6^3 = \overset{\text{sq. ft.}}{216}$

$$\overset{\text{oz.}}{2654} \times 216 = \overset{\text{oz.}}{573264} = \overset{\text{cwt.}}{319}\ \overset{\text{qr.}}{3}\ \overset{\text{lb.}}{17}$$

(16) $\dfrac{44^3}{277{\cdot}274} = \dfrac{85184}{277{\cdot}274} = 307\frac{32441}{138637}$

EVOLUTION.

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(21) Mean proportional $= (16 \times 144)^{\frac{1}{2}} = 2304^{\frac{1}{2}} = 48$

(22) Mean proportional $= (19 \times 41)^{\frac{1}{2}} = 779^{\frac{1}{2}} = 27{\cdot}91057$

(23) True weight $= (43 \times 89)^{\frac{1}{2}} = 3827^{\frac{1}{2}} = 61{\cdot}86275$

(24) Side of the square $= 7085^{\frac{1}{2}} = 84{\cdot}1724$ in.

(25)

	ac.	ro.	po.	
First field measures,	2	1	30	
Second "	3	2	15	
Third "	1	3	27	sq. po.
	7	3	32	= 1272

$\therefore$ Side of the square $= 1272^{\frac{1}{2}} = 35{\cdot}665109$

(26) $\overset{\text{ac.}}{3}\ \overset{\text{ro.}}{1}\ \overset{\text{po.}}{35} = \overset{\text{sq po.}}{555}$

Side of the square $= (555 \times 3\frac{1}{2})^{\frac{1}{2}} = 1942{\cdot}5^{\frac{1}{2}} = 44{\cdot}0738$

(27) $2500\,(= 50^2) : 14400\,(= 120^2) :: \overset{\pounds}{74}\ \overset{s.}{16}\ \overset{d.}{8}$

$$\frac{\overset{\pounds}{74}\ \overset{s.}{16}\ \overset{d.}{8} \times 144}{25} = \frac{\overset{\pounds}{10776}}{25} = \overset{\pounds}{431}\ \overset{s.}{0}\ \overset{d.}{9\tfrac{1}{2}}\,\tfrac{2}{5}$$

(28) $$3{\cdot}5^2 : 1{\cdot}5^2 :: \overset{\text{hr.}}{5}$$

$$\frac{15 \times 15 \times 5}{35 \times 35} = \frac{3 \times 3 \times 5}{7 \times 7} = \overset{\text{hr.}}{\frac{45}{49}} = \overset{\text{min.}}{55}\ \overset{\text{sec.}}{6\tfrac{6}{49}}$$

(29) $4 : 20 :: 3^2 :$ square of the diameter.

$\therefore (9 \times 5)^{\frac12} = 45^{\frac12} = 6{\cdot}7082 =$ diameter required.

(30) Hypotenuse $= (342^2 + 475^2)^{\frac12} = (116964 + 225625)^{\frac12}$
$= 342589^{\frac12} = 585{\cdot}311028$

(31) Ladder $= (31^2 + 24^2)^{\frac12} = (961 + 576)^{\frac12} = 1537^{\frac12} = 39{\cdot}20459$

(32) Breadth of river $= (582^2 - 261^2)^{\frac12} = (338724 - 68121)^{\frac12}$
$= 270603^{\frac12} = 520{\cdot}19515$

(33) $(122)^{\frac12} = 11{\cdot}04536$, the side in miles.

(34) $(122550)^{\frac12} = 350{\cdot}07142$, the side in miles.

(35) $(36 \times 38\tfrac12)^{\frac12} = (1386)^{\frac12} = 37{\cdot}229$ lb. nearly.

(36) $(25 \times 36)^{\frac12} = (900)^{\frac12} = 30$ lb.

(37) $\left(\frac{2318{\cdot}4}{16{\cdot}1}\right)^{\frac12} = (144)^{\frac12} = 12$ seconds.

(38) $\left(\frac{300}{16{\cdot}1}\right)^{\frac12} = (18{\cdot}63354)^{\frac12} = 4{\cdot}31665 +$ seconds.

(39) $(12 \times 75)^{\frac12} = (900)^{\frac12} = 30$
$(75 \times 363)^{\frac12} = (27225)^{\frac12} = 165$

(40) $7 : 13 :: (21^2 = 441) : 819 =$ the square of the second diameter.
$(819)^{\frac12} = 28{\cdot}618 +$

(41) $(725^2 - 465^2)^{\frac12} = (1190 \times 260)^{\frac12} = 556{\cdot}237 +$

(42) The sum of the squares of the length and width is evidently the square of a line drawn from one corner to the opposite corner on the floor, and the square of this line with the square of the height will be the square of the line sought;

hence $(24^2 + 18^2 + 12^2)^{\frac12} = (1044)^{\frac12} = 32{\cdot}311$ nearly.

(43) $(55^2 - 44^2)^{\frac12} + (55^2 - 40^2)^{\frac12} = (1089)^{\frac12} + (1425)^{\frac12}$
$= 33 + 37{\cdot}7492 = 70{\cdot}7492$ nearly.

(44) $15 : 40 :: 1^2 : (\text{diameter})^2 = 2{\cdot}\dot{6}$

$\therefore (2{\cdot}\dot{6})^{\frac12} = 1{\cdot}632993$

EXTRACTION OF THE CUBE ROOT.

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(1)

$$\begin{array}{rrl}
4^2 \times 300 = & 4800 & 110,592(48 \\
(4 \times 30 + 8) \times 8 = & \underline{1024} & \underline{64} \\
 & 5824 & 46592 \\
 & & 46592
\end{array}$$

(2)

$$\begin{array}{rrl}
7^2 \times 300 = & 14700 & 373,248(72 \\
(7 \times 30 + 2) \times 2 = & \underline{424} & \underline{343} \\
 & 15124 & 30248 \\
 & & 30248
\end{array}$$

(3)

$$\begin{array}{rrl}
9^2 \times 300 = & 24300 & 843,908,625(945 \\
(9 \times 30 + 4) \times 4 = & \underline{1096} & \underline{729} \\
 & 25396 & 114908 \\
4^2 = & \underline{16} & \underline{101584} \\
 & 2650800 & 13324625 \\
(94 \times 30 + 5) \times 5 = & \underline{14125} & \\
 & 2664925 & 13324625
\end{array}$$

(4)

$$\begin{array}{rrl}
6^2 \times 300 = & \underline{10800} & 219,365,327,791(6031 \\
 & & \underline{216} \\
60^2 \times 300 = & 1080000 & 3365327 \\
(60 \times 30 + 3) \times 3 = & \underline{5409} & \\
 & 1085409 & \underline{3256227} \\
3^2 = & \underline{9} & 109100791 \\
 & 109082700 & \\
(603 \times 30 + 1) \times 1 = & \underline{18091} & \\
 & 109100791 & 109100791
\end{array}$$

(5)	$1^2 \times 300 =$	300	3·539(1·52391
	$(1 \times 30 + 5) \times 5 =$	175	1
		475	2539
	$5^2 =$	25	2375
		67500	164000
	$(15 \times 30 + 2) \times 2 =$	904	
		68404	136808
	$2^2 =$	4	27192000
		6931200	
	$(152 \times 30 + 3) \times 3 =$	13689	
		6944889	20834667
	$3^2 =$	9	6357333000
		695858700	
	$(1523 \times 30 + 9) \times 9 =$	411291	
		696269991	6266429919
	$9^2 =$	81	90908081000
		69668136300	
	$(15239 \times 30 + 1) \times 1 =$	457171	
		69668593471	69668593471
			21234487529

The other figures of the root may be found by proceeding by the contracted method of division of decimals.

(6)	$2^2 \times 300 =$	1200	11(2·22398
	$(2 \times 30 + 2) \times 2 =$	124	8
		1324	3000
	$2^2 =$	4	2648
		145200	352000
	$(22 \times 30 + 2) \times 2 =$	1324	
		146524	293048
	$2^2 =$	4	58952000
		14785200	
	$(222 \times 30 + 3) \times 3 =$	19989	
		148051,8,9	44415567
			14536433
			13324670
			1211763
			1184415
			27348

(7)

$2^2 \times 300 =$	1200	24(2·884499
$(2 \times 30 + 8) \times 8 =$	544	8
	1744	16000
$8^2 =$	64	13952
	235200	2048000
$(28 \times 30 + 8) \times 8 =$	6784	
	241984	1935872
$8^2 =$	64	112128000
	$2488320\dot{0}$	
$(288 \times 30 + 4) \times 4 =$	34576	
	24917776	99671104
$4^2 =$	16	12456896000
	2495236800	
$(2884 \times 30 + 4) \times 4 =$	346096	
	2495582896	9982331584
		2474564416

(8)

$1^2 \times 300 =$	300	7·520(1·959172
$(1 \times 30 + 9) \times 9 =$	351	1
	651	6520
$9^2 =$	81	5859
	108300	661000
$(19 \times 30 + 5) \times 5 =$	2875	
	111175	555875
$5^2 =$	25	105125000
	11407500	
$(195 \times 30 + 9) \times 9 =$	52731	
	11460231	103142079
		1982921

(9)	$2^2 \times 300 =$	1200	$9{,}613{\cdot}\dot{9}\dot{2}9(21{\cdot}2634$
	$(2 \times 30 + 1) \times 1 =$	61	8
		1261	1613
	$1^2 =$	1	1261
		132300	352929
	$(21 \times 30 + 2) \times 2 =$	1264	
		133564	267128
	$2^2 =$	4	85801292
		13483200	
	$(212 \times 30 + 6) \times 6 =$	38196	
		13521396	81128376
			4672916

(10) $\sqrt[3]{216} = 6$

(11) $5 \times 4 \times 6\frac{1}{4} = 20 \times 6\frac{1}{4} = 125$, the solid content.

$\sqrt[3]{125} = 5$

(12) $\overset{\text{lb.}}{5} : \overset{\text{lb.}}{40} :: 4^3 : \dfrac{64 \times 40}{5} = 512$

$\sqrt[3]{512} = 8$

(13) Here $4 \times 4 \times 4 \times 27 = 1728$, the content.

$\sqrt[3]{1728} = 12$, the side sought.

(14)	$1^2 \times 300 =$	300	$2218{\cdot}192(13{\cdot}041665$
	$(1 \times 30 + 3)3 = 33 \times 3 =$	99	1
		399	1218
	$3^2 =$	9	1197
		5070000	21192000
	$(130 \times 30 + 4) \times 4 = 3904 \times 4 =$	15616	20342464
		5085616	849536000
	$4^2 =$	16	510163921
		510124800	33937,2079
	$(1304 \times 30 + 1)1 =$	39121	30612
		510163921	3325
	$1^2 =$	1	3061
		51,0,2,03043	264
			255

(15)

$3^2 \times 300 =$	2700	61,023·,791,79(39·37008
$(3 \times 30 + 9) \times 9 = 99 \times 9 =$	891	27
	3591	34023
$9^2 =$	81	32319
	456300	1704791
$(39 \times 30 + 3) \times 3 = 1173 \times 3 =$	3519	1379457
	459819	325334000
$3^2 =$	9	324920953
	46334700	4130,47
$(393 \times 30 + 7) \times 7 =$	82579	3720
	46417279	410
$7^2 =$	49	
	464,9,9,907	

(16)

$$\frac{4188800}{\cdot5236} = \frac{41888000000}{5236} = 8000000$$

$$\sqrt[3]{(8000000)} = 200$$

(17)

$$\frac{5254725974\cdot3748}{\cdot5236} = 10035763893$$

$2^2 \times 300 =$	1200	10,035,763,893(2157
$(2 \times 30 + 1) \times 1 =$	61	8
	1261	2035
$1^2 =$	1	1261
	132300	774763
$(21 \times 30 + 5) \times 5 =$	3175	677375
	135475	97388893
$5^2 =$	25	97388893
	13867500	
$(215 \times 30 + 7) \times 7 =$	45199	
	13912699	

(18) $(365\cdot256384)^2 : (686\cdot076119)^2 :: 1^3 : 3\cdot528165709$

$1^2 \times 300 =$	300	3·528,165,709(1·522357 —
$(1 \times 30 + 5) \times 5 =$	175	1 nearly.
	475	2528
$5^2 =$	25	2375
	67500	153165
$(15 \times 30 + 2) \times 2 =$	904	136808
	68404	16357709
$2^2 =$	4	13880648
	6931200	2477061
$(152 \times 30 + 2) \times 2 =$	9124	2085246
	6940324	391815
$2^2 =$	4	347609
	694945200	44206
$(1522 \times 30 + 3) \times 3 =$	136989	48665
	695082,189	
	6952,1,9	

(19) $(365\cdot256384)^2 : (4332\cdot5693)^2 :: 1^3 : 140\cdot70042363$

$5^2 \times 300 =$	7500	140·700423630(5·2011390953
$(5 \times 30 + 2) \times 2 =$	304	125 or 5·20114 nearly.
	7804	15700
$2^2 =$	4	15608
	81120000	92423630
$(520 \times 30 + 1) \times 1 =$	15601	81135601
	81135601	11288029
$1^2 =$	1	8115276
	8115120300	3172753
$(5201 \times 30 + 1) \times 1 =$	156031	2434627
	8115276,331	738126
	81,1,5,4,3,2	730389
		7737
		7304
		433
		406

SERIES.

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I. EQUIDIFFERENT SERIES.

(1) Last term $= 5 + 99 \times 11 = 5 + 1089 = 1094$

(2) Last term $= 59 - 23 \times 2 = 59 - 46 = 13$

(3) Sum $= \dfrac{(17 + 85) \times 17}{2} = 51 \times 17 = 867$

(4) Sum $= \dfrac{(100 + 21) \times 85}{2} = \dfrac{121 \times 85}{2} = \dfrac{10285}{2} = 5142\frac{1}{2}$

(5) Sum $= \dfrac{(1 + 12) \times 12 \times 2}{2} = 13 \times 12 = 156$

(6) Last term $= 1 + 2 \times 51 = \overset{s.}{103} = \overset{£}{5}\ \ \overset{s.}{3}$

Sum $= (1 + 103)\frac{52}{2} = 104 \times 26 = \overset{s.}{2704} = \overset{£}{135}\ \ \overset{s.}{4}$

(7) A's walking $= (3 + 3 + 7 \times 2)\frac{8}{2} = 20 \times 4 = 80$

B's 〃 $= (4 + 4 + 7 \times 2)\frac{8}{2} = 22 \times 4 = 88$

$\therefore$ A's + B's walking $= 168$ miles.

II. EQUIRATIONAL SERIES.

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(8) Last term $= 4 \times 3^{12} = 4 \times 531441 = 2125764$

(9) Last term $= 100 \times \dfrac{1}{2^{16}} = \dfrac{25}{2^{14}} = \dfrac{25}{16384}$

[illegible]0) Sum $= \dfrac{5(3^{14} - 1)}{3 - 1} = \dfrac{5 \times 4782968}{2} = 11957420$

(11) $$\text{Sum} = \frac{8(4^{12}-1)}{4-1} = \frac{8 \times 16777215}{3} = 44739240$$

(12) $$\text{Sum} = \frac{1-\frac{1}{5^{10}}}{1-\frac{1}{5}} = \frac{1-\frac{1}{9765625}}{\frac{4}{5}} = \frac{5 \times 9765624}{4 \times 9765625}$$

$$= \frac{2441406}{1953125} = 1\tfrac{488281}{1953125}$$

LOGARITHMS.

Page 226.

(9)

log. 73·627 . = 1·8670371
log. ·01852 . = $\bar{2}$·2676410
log. 9·31654 = 0·9692547
log. 12·70377 = 1·1039328

(10)

log. ·68715 . = $\bar{1}$·8370516
log. ·00354 . = $\bar{3}$·5490033
log. 839·612 . = 2·9240786
log. ·5183 . = $\bar{1}$·7145812
log. 1·058558 = 0·0247147

(11)

log. 68·3167 . = 1·8345269
log. 983·7 . = 2·9928627
log. ·0694487 = $\bar{2}$·8416642

(12)

log. ·05685 . = $\bar{2}$·7547305
log. ·73254 . = $\bar{1}$·8648318
log. ·07760669 = $\bar{2}$·8898992

(13)

log. 1·03721 = 0·0158667
3
log. 1·115835 = 0·0476001

(14)

log. 1·05 . . = 0·0211893
20
log. 2·653297 = 0·4237860

(15)

log. 1·025 . = 0·0107239
31
log. 2·150011 = 0·3324409

(16)

2)1·0413927 = log. 11
0·5206963 = log. 3·316624

(17)

3)1·9637878 = log. 92
0·6545959 = log. 4·514357

(18)

5)0·7126497 = log. 5·16
0·1425299 = log. 1·388449

(19) 10)$\bar{1}$·2136240 = log. ·16354
$\bar{1}$·9213624 = log. ·8343771

(20) log. 1·716 = 0·2345173
log. ·073459 = $\bar{2}$·8660450
log. 78·615 = 1·8955054
log. 54·728 = 1·7382096
2·7342773
log. 69·73 = 1·8434197
log. ·969312 = $\bar{1}$·9864636
log. 81·7346 = 1·9124060
3·7422893
log. ·098172 = $\bar{2}$·9919880

(21)

3 log. 7·854 = 2·6852727
$\frac{1}{3}$ log. 3·14169 = 0·1657211
2·8509938
4 log. 5·12796 = 2·8397780
log. 1·02616 = 0·0112158

(22)

10 log. 1·83 = 2·6245110
$\frac{1}{4}$ log. ·6075 = $\bar{1}$·9458865
2·5703975
2 log. 7·19 = 1·7134578
log. 7·19349 = 0·8569397

COMPOUND INTEREST.

Page 230.

(6)

A. = 1·04^{17} × 325·625
1·04^{17} = 1·9479005
526·523
634·2850
£634 5 8½
17 log. 1·04 = 0·2895667
log. 325·625 = 2·5127178
log. 634·285 = 2·8022845
or £634, 5s. 8½d.

(7)

A. = 1·05^{50} × $724\cdot66\dot{6}$
1·05^{50} = 11·4673998
66666·427
8310·0424
£8310 0 10
50 log. 1·05 = 1·0594649
log. $724\cdot66\dot{6}$ = 2·8601383
log. 8310·042 = 3·9196032
or £8310, 0s. 10d.

(8)
A. = $1{\cdot}045^{19} \times 987{\cdot}7875$
$1{\cdot}045^{19} = 2{\cdot}3078603$
5787·789
2279·6754
£2279 13 6
19 log. 1·045 = 0·3632095
log. 987·7875 = 2·9946635
log. 2279·675 = 3·3578730
or £2279, 13s. 6d.

(9)
A. = $1{\cdot}0475^{64} \times 1728{\cdot}83\dot{3}$
$1{\cdot}0475^{64} = 19{\cdot}4920728$
33338·8271
33698·5455
£33698 10 10¾
64 log. 1·0475 = 1·2898580
log. $1728{\cdot}83\dot{3}$ = 3·2377532
log. 33698·55 = 4·5276112
or £33698, 11s. 10½d.

(10)
A. = $1{\cdot}025^{61} \times 618{\cdot}575$
$1{\cdot}025^{61} = 4{\cdot}5097845$
575·816
2789·6399
£2789 12 9½
61 log. 1·025 = 0·6541557
log. 618·575 = 2·7913924
log. 2789·640 = 3·4455481
or £2789, 12s. 9½d.

(11)
A. = $1{\cdot}02^{44} \times 837{\cdot}375$
$1{\cdot}02^{44} = 2{\cdot}3900531$
573·738
2001·3707
£2001 7 5
44 log. 1·02 = 0·3784075
log. 837·375 = 2·9229200
log. 2001·370 = 3·3013275
or £2001, 7s. 5d.

(12)
A. = $1{\cdot}01^{60} \times 235{\cdot}75$
$1{\cdot}01^{60} = 1{\cdot}8166967$
57·532
428·2862
£428 5 8½
60 log. 1·01 = 0·2592824
log. 235·75 = 2·3724517
log. 428·286 = 2·6317341
or £428, 5s. 8½d.

(13)
A. = $1{\cdot}06^{18} \times 1200$
$1{\cdot}06^{18} = 2{\cdot}854339$
0021
2854339
570868
3425·207
£3425 4 1¾
18 log. 1·06 = 0·4555055
log. 1200 = 3·0791812
log. 3425·206 = 3·5346867
or £3425, 4s. 1½d.

(14)

P. V. = $1{\cdot}05^{-11} \times 231{\cdot}5$

$1{\cdot}05^{-11}$ = ·5846793
5·132

135·3533

£135 7 0¾

log. 231·5 = 2·3645510
11 log. 1·05 = 0·2330822

log. 135·353 = 2·1314688
or £135, 7s. 0¾d.

(15)

P. V. = $1{\cdot}035^{-5} \times 1000$

$1{\cdot}035^{-5}$ = ·8419732
·0001

841·9732

£841 19 5½

log. 1000 = 3·0000000
5 log. 1·035 = 0·0747017

log. 841·973 = 2·9252983
or £841, 19s. 5½d.

(16)

P. V. = $1{\cdot}025^{-22} \times 719{\cdot}875$

$1{\cdot}025^{-22}$ = ·5808647
578·917

418·1499

£418 2 11¾

log. 719·875 = 2·8572571
22 log. 1·025 = 0·2359250

log. 418·150 = 2·6213321
or £418, 3s.

(17)

P. V. = $1{\cdot}045^{-27} \times 837{\cdot}775$

$1{\cdot}045^{-27}$ = ·3046914
577·738

255·2627

£255 5 3

log. 837·775 = 2·9231274
27 log. 1·045 = 0·5161398

log. 255·262 = 2·4069876
or £255, 5s. 3d.

(18) Present value in 3 payments =

$4000 + 1{\cdot}03^{-10} \times 4000 + 1{\cdot}03^{-20} \times 4000$

4000 . . = 4000
·7440939 × 4000 = 2976·3756
·5536758 × 4000 = 2214·7032

P. V. in 3 payments, = 9191·0788
·7440939 × 1200 = 8929·1268

261·9520

£261 19 0½

(19)

$$\text{Am.} = 1{\cdot}018^{10} \times 17927609$$

$$\begin{array}{lcr} 1{\cdot}018^{10} & = & 1{\cdot}195302368 \\ & & 90672971 \\ \hline & & 21428913{\cdot}3 \end{array}$$

$$\begin{array}{rcr} 10 \text{ log. } 1{\cdot}018 & = & 0{\cdot}0774778 \\ \text{log. } 17927609 & = & 7{\cdot}2535223 \\ \hline \text{log. } 21428911 & = & 7{\cdot}3310001 \end{array}$$

ANNUITIES.

I. ANNUITIES CERTAIN.

Page 233.

In solving the following exercises, Table III. may be used.

(1)

$$\text{A.} = \frac{1{\cdot}04^{25} - 1}{{\cdot}04} \times 160$$

$$\begin{array}{r} 1{\cdot}04^{25} = 2{\cdot}6658363 \\ 1{\cdot} \\ \hline {\cdot}04)\,1{\cdot}6658363 \\ \hline 41{\cdot}645907 \\ 061 \\ \hline 6663{\cdot}345 \\ \hline \pounds 6663 \quad 6 \quad 10\tfrac{3}{4} \end{array}$$

(2)

$$\text{A.} = \frac{1{\cdot}035^{7} - 1}{{\cdot}035} \times 78{\cdot}5$$

$$\begin{array}{r} 1{\cdot}035^{7} = 1{\cdot}2722793 \\ 1{\cdot} \\ \hline {\cdot}035)\ {\cdot}2722793 \\ \hline 7{\cdot}779408 \\ 5{\cdot}87 \\ \hline 610{\cdot}6835 \\ \hline \pounds 610 \quad 13 \quad 8 \end{array}$$

(3)

$$\text{A.} = \frac{1{\cdot}025^{28} - 1}{{\cdot}05} \times 346$$

$$\begin{array}{r} 1{\cdot}025^{28} = 2{\cdot}5556824 \\ 1 \\ \hline {\cdot}05)\,1{\cdot}5556824 \\ \hline 31{\cdot}113648 \\ 643 \\ \hline 10765{\cdot}3222 \\ \hline \pounds 10765 \quad 6 \quad 5\tfrac{1}{4} \end{array}$$

(4)

$$\text{A.} = \frac{1{\cdot}03^{16} - 1}{{\cdot}03} \times 725{\cdot}666$$

$$\begin{array}{r} 1{\cdot}03^{16} = 1{\cdot}6047064 \\ 1 \\ \hline {\cdot}03)\ {\cdot}6047064 \\ \hline 20{\cdot}156880 \\ 666666{\cdot}527 \\ \hline 14627{\cdot}1758 \\ \hline \pounds 14627 \quad 3 \quad 6\tfrac{1}{4} \end{array}$$

In solving the following exercises, Table IV. may be used.

(5)

$$\text{P.V.} = \frac{1 - 1\cdot03^{-17}}{\cdot03} \times 126$$

1·

$1\cdot03^{-17} = \cdot6050164$

·03) ·3949836

13·16612

621

1658·931

£1658 18 7½

(6)

$$\text{P.V.} = \frac{1 - 1\cdot05^{-20}}{\cdot05} \times 225$$

1·

$1\cdot05^{-20} = \cdot3768895$

·05) ·6231105

12·46221

522

2803·997

£2803 19 11¼

(7)

$$\text{P.V.} = \frac{1 - 1\cdot035^{-25}}{\cdot035} \times 62$$

1·

$1\cdot035^{-25} = \cdot4231470$

·035) ·5768530

16·481514

26

1021·8538

£1021 17 0¾

(8)

$$\frac{1 - 1\cdot04^{-9}}{\cdot04} \times 550$$

1·

$1\cdot04^{-9} = \cdot7025867$

·04) ·2974133

7·435332

055

4089·4326

Discount, 300

3789·432

£3789 8 7¾

(9) $$\text{P.V.} = \frac{1}{\cdot025} \times 160 = \overset{\pounds}{6400}$$

(10) $$\text{P.V.} = \frac{1\cdot035^{-17} - 1\cdot035^{-42}}{\cdot035} \times 627$$

$1\cdot035^{-17} = \cdot5572038$

$1\cdot035^{-42} = \cdot2357791$

·035)·3214247

9·1835628

726

5758·0939

£5758 1 10½

(11) $$\text{P. V.} = \frac{1\cdot04^{-10} - 1\cdot04^{-100}}{\cdot04} \times 450$$

$1\cdot04^{-10} = \cdot6755642$

$1\cdot04^{-100} = \cdot0198000$

$\cdot04)\cdot6557642$

16·394105

054

7377·3473

£7377 6 11¼

(12) $$\text{P. V.} = \frac{1\cdot05^{-6} - 1\cdot05^{-24}}{\cdot05} \times 547\cdot9$$

$1\cdot05^{-6} = \cdot7462154$

$1\cdot05^{-24} = \cdot3100673$

$\cdot05)\cdot4361475$

8·722950

9·745

4779·3044

£4779 6 1

(13) $$\text{P. V.} = \frac{1\cdot045^{-12} - 1\cdot045^{-42}}{\cdot045} \times 1265\cdot375$$

$1\cdot045^{-12} = \cdot5896639$

$1\cdot045^{-42} = \cdot1574403$

$\cdot045)\cdot4322236$

9·60496888

573·5621

12153·8874

£12153 17 9

(14) $$\text{P. V.} = \frac{1\cdot025^{-35}}{\cdot025} \times 925$$

$\cdot025)\cdot4213711$

16·8548427

529

15590·7295

£15590 14 7¼

MISCELLANEOUS EXERCISES.

Page 236.

(1) $$\text{P.V.} = \frac{724{\cdot}8}{{\cdot}0375} = \pounds 19328$$

(2) 16 : 1 : : £19400 : £1212 10s.

(3) 100 : 1000 : : £4½ : £45

(4) $\text{A.} = 1{\cdot}1^{25} \times 1800$

$1{\cdot}1^{25} = 10{\cdot}83470596$

$$\begin{array}{r} 10{\cdot}83470596 \\ {\cdot}0081 \\ \hline 108347060 \\ 86677647 \\ \hline 19502{\cdot}4707 \\ \hline \pounds 19502 \quad 9 \quad 4\tfrac{3}{4} \end{array}$$

(5) 10000 : 100 : : £320 : £3 4s.

(6) £250 12s. 6d. : £6265 12s. 6d. : 1 year : 25 years.

(7) 5 : 100 : : 1 year : 20 years.

(8) $$\text{Leasehold} = \frac{1 - 1{\cdot}05^{-70}}{{\cdot}05} \times 325 = \pounds 6286 \; 7s. \; 4\tfrac{1}{2}d.$$

$$\text{Freehold} = \frac{1}{{\cdot}05} \times 325 = \pounds 6500 \; 0 \; 0$$

$$\pounds 213 \; 12 \; 7\tfrac{1}{2}$$

$$1{\cdot}05^{-70} = \begin{array}{r} 1 \\ {\cdot}0328662 \\ \hline {\cdot}05){\cdot}9671338 \\ \hline 19{\cdot}342676 \\ 523 \\ \hline 6286{\cdot}369 \\ \hline \pounds 6286 \quad 7 \quad 4\tfrac{1}{2} \end{array} \qquad \begin{array}{r} {\cdot}05)325 \\ \hline 6500 \end{array}$$

(9) $$\text{Younger son's legacy} = \frac{1 - 1{\cdot}03^{-15}}{{\cdot}03} \times 1728 = \pounds 20628 \; 15s. \; 1d.$$

$$\text{Elder} \; . \; . \; . = \frac{1{\cdot}03^{-15}}{{\cdot}03} \times 1728 = 36971 \; 4 \; 11$$

$$1{\cdot}03^{-15} = \begin{array}{r} 1 \\ {\cdot}6418619 \\ \hline {\cdot}03){\cdot}3581381 \\ \hline 11{\cdot}93793666 \\ 8271 \\ \hline 20628{\cdot}7546 \\ \hline \pounds 20628 \quad 15 \quad 1 \end{array} \qquad \begin{array}{r} {\cdot}03){\cdot}6418619 = 1{\cdot}03^{-15} \\ \hline 21{\cdot}39539666 \\ 8271 \\ \hline 36971{\cdot}2455 \\ \hline \pounds 36971 \quad 4 \quad 11 \end{array}$$

(10) $$\text{Fine} = \frac{1{\cdot}04^{-15} - 1{\cdot}04^{-20}}{{\cdot}04} \times 186{\cdot}375 = \overset{\pounds}{460}\ \ \overset{s.}{14}\ \ \overset{d.}{1\tfrac{3}{4}}$$

$$\begin{array}{rl}
1{\cdot}04^{-15} = & {\cdot}5552645\\
1{\cdot}04^{-20} = & \underline{{\cdot}4563870}\\
{\cdot}04) & \underline{{\cdot}0988775}\\
& 2{\cdot}4719375\\
& \underline{573{\cdot}681}\\
& \underline{460{\cdot}7074}\\
& \pounds 460\ \ 14\ \ 1\tfrac{3}{4}
\end{array}$$

(11) $$\text{Yearly deduction} = \frac{800 \times {\cdot}05}{1{\cdot}05^{-3} - 1{\cdot}05^{-24}} = \overset{\pounds}{72}\ \ \overset{s.}{4}\ \ \overset{d.}{7\tfrac{3}{4}}$$

$$\begin{array}{rrl}
1{\cdot}05^{-3} = & {\cdot}8638376 & 800\\
1{\cdot}05^{-24} = & \underline{{\cdot}3100679} & \underline{{\cdot}05}\\
& {\cdot}5537697 & \underline{)40}\\
& & \underline{72{\cdot}232}\\
& & \pounds 72\ \ 4\ \ 7\tfrac{3}{4}
\end{array}$$

II. LIFE OR CONTINGENT ANNUITIES.

Page 238.

(1) $\text{P. V.} = a_{47} \times 225 = 15{\cdot}294 \times 225 = 3441{\cdot}15 =$ £3441, 3s.

(2) $\text{Annuity} = \dfrac{820}{a_{60}} = \dfrac{820}{9{\cdot}663} = 84{\cdot}859 =$ £84, 17s. 2¼d.

(3) $\text{P. V.} = a_{57} \times 75 = 11{\cdot}614 \times 75 = 871{\cdot}05 =$ £871, 1s.

(4) $\text{P.V.} = a_{40} \times 256 = 15{\cdot}074 \times 256 = 3858{\cdot}944 =$ £3858, 18s. 10½d.

(5) $\text{Annuity} = \dfrac{7200}{a_{51}} = \dfrac{7200}{13{\cdot}932} = 516{\cdot}795 =$ £516, 15s. 10¾d.

(6) $\text{P. V.} = a_{45,\,70} \times 450 = 6{\cdot}113 \times 450 = 2750{\cdot}85 =$ £2750, 17s.

(7)
$$\begin{array}{rl}
a_{35,\,35} = & 14{\cdot}720\\
a_{35,\,40} = & \underline{14{\cdot}048}\\
& {\cdot}672
\end{array}$$

$$\therefore\ a_{35,\,39} = 14{\cdot}720 - {\cdot}672 \times \frac{4}{5} = 14{\cdot}720 - {\cdot}538 = 14{\cdot}182$$

$$\therefore\ \text{P. V.} = a_{35,\,39} \times 57{\cdot}5 = 14{\cdot}182 \times 57{\cdot}5 = 815{\cdot}465 = \pounds 815,\ 9\text{s. } 3\tfrac{1}{2}\text{d.}$$

(8) $$\text{Annuity} = \frac{900}{a_{45,\,50}} = \frac{900}{9{\cdot}737} = 92{\cdot}430 = \pounds 92,\ 8\text{s. } 7\tfrac{1}{4}\text{d.}$$

(9) $$\text{P. V.} = (a_{27} + a_{35} - a_{27,\,35}) \times 166{\cdot}33\dot{3}$$

$$\begin{array}{lcr}
a_{27} & = & 20{\cdot}212 \\
a_{35} & = & 18{\cdot}433 \\
\hline
 & & 38{\cdot}645 \\
a_{27,\,35} & = & 15{\cdot}480 \\
\hline
 & & 23{\cdot}165000 \\
 & & 333333{\cdot}661 \\
\hline
 & & 3853{\cdot}1115 \\
\hline
 & & \pounds 3853\ \ 2\ \ 2\tfrac{3}{4}
\end{array}$$

(10) $$\text{P. V.} = (a_{30} + a_{50} - a_{30,\,50}) \times 78{\cdot}7791\dot{6}$$

$$\begin{array}{lcr}
a_{30} & = & 14{\cdot}723 \\
a_{50} & = & 11{\cdot}660 \\
\hline
 & & 26{\cdot}383 \\
a_{30,\,50} & = & 10{\cdot}404 \\
\hline
 & & 15{\cdot}97900 \\
 & & 661977{\cdot}87 \\
\hline
 & & 1258{\cdot}8122 \\
\hline
 & & \pounds 1258\ \ 16\ \ 3
\end{array}$$

(11) $$\text{P. V.} = (a_{42} + a_{50} - a_{42,\,50}) \times 362{\cdot}7$$

$$\begin{array}{lcr}
a_{42} & = & 14{\cdot}695 \\
a_{50} & = & 12{\cdot}869 \\
\hline
 & & 27{\cdot}564 \\
a_{42,\,50} & = & 10{\cdot}773 \\
\hline
 & & 16{\cdot}791000 \\
 & & 7{\cdot}263 \\
\hline
 & & 6090{\cdot}0957 \\
\hline
 & & \pounds 6090\ \ 1\ \ 11
\end{array}$$

(12) $\text{P. V.} = (a_{45} - a_{45,\,75}) \times 438{\cdot}925$

$a_{45} = 14{\cdot}105$

$a_{45,\,75} = 4{\cdot}850$

9·25500
529·834

4062·251

£4062 5 0¼

(13) $\text{P. V.} = (a_{20} - a_{20,\,65}) \times 125{\cdot}6$

$a_{20} = 15{\cdot}817$

$a_{20\,65} = 7{\cdot}361$

8·45600
6·521

1062·074

£1062 1 5¾

$$\text{Sin. pay.} = \frac{1062{\cdot}074}{8{\cdot}361} = 127{\cdot}027 = £127\ \ 0\ \ 6\tfrac{1}{2}$$

(14) $\text{P. V.} = (a_{35} - a_{35,\,75}) \times 256$

$a_{35} = 16{\cdot}041$

$a_{35,\,75} = 4{\cdot}933$

11·10800
652

2843·648

£2843 12 11½

(15) $$\text{P. V.} = 16{\cdot}890 \times {\cdot}7664167 \times \frac{5009}{5528} \times 73{\cdot}425$$

log. 16·890 = 1·2276296
log. ·7664167 = $\bar{1}{\cdot}8844650$
log. 5009 = 3·6997510
A. C. log. 5528 * = 6·2574320
log. 73·425 = 1·8658440

log. 861·235 = 2·9351216
or £861 4 8½

* See 'Mathematical Tables,' par. 18.

(16) $$\text{P. V.} = 6{\cdot}799 \times {\cdot}3768895 \times \frac{4397}{5642} \times \frac{3018}{4727} \times 32{\cdot}75$$

$$\begin{array}{rlcl}
 & \text{log. } 6{\cdot}799 & = & 0{\cdot}8324450 \\
 & \text{log. } {\cdot}3768895 & = & \bar{1}{\cdot}5762141 \\
 & \text{log. } 4397 & = & 3{\cdot}6431565 \\
\text{A. C.} & \text{log. } 5642 & = & 6{\cdot}2485669 \\
 & \text{log. } 3018 & = & 3{\cdot}4797192 \\
\text{A. C.} & \text{log. } 4727 & = & 6{\cdot}3254144 \\
 & \text{log. } 32{\cdot}75 & = & 1{\cdot}5152113 \\
\hline
 & \text{log. } 41{\cdot}756 & = & 1{\cdot}6207274
\end{array}$$

or £41, 15s. 1½d.

(17)

$$\text{P. V.} = a_{32} \times 1{\cdot}04^{-7} \times \frac{5528}{5879} \times 560 = 16{\cdot}552 \times {\cdot}7599178 \times \frac{5528}{5879} \times 560$$

$$\begin{array}{rlcl}
 & \text{log. } 16{\cdot}552 & = & 1{\cdot}2188505 \\
 & \text{log. } {\cdot}7599178 & = & \bar{1}{\cdot}8807666 \\
 & \text{log. } 5528 & = & 3{\cdot}7425680 \\
\text{A. C.} & \text{log. } 5879 & = & 6{\cdot}2306965 \\
 & \text{log. } 560 & = & 2{\cdot}7481880 \\
\hline
 & \text{log. } 6623{\cdot}225 & = & 3{\cdot}8210696
\end{array}$$

£6623, 4s. 6d.

(18)

$$\text{P. V.} = a_{31,35} \times 1{\cdot}05^{-10} \times \frac{5585}{6047} \times \frac{5362}{5879} \times 85{\cdot}875$$

$$= 12{\cdot}018 \times {\cdot}6139133 \times \frac{5585}{6047} \times \frac{5362}{5879} \times 85{\cdot}875$$

$$\begin{array}{rlcl}
 & \text{log. } 12{\cdot}018 & = & 1{\cdot}0798322 \\
 & \text{log. } {\cdot}6139133 & = & \bar{1}{\cdot}7881070 \\
 & \text{log. } 5585 & = & 3{\cdot}7470232 \\
\text{A. C.} & \text{log. } 6047 & = & 6{\cdot}2184600 \\
 & \text{log. } 5362 & = & 3{\cdot}7293268 \\
\text{A. C.} & \text{log. } 5879 & = & 6{\cdot}2306965 \\
 & \text{log. } 85{\cdot}875 & = & 1{\cdot}9338668 \\
\hline
 & \text{log. } 533{\cdot}718 & = & 2{\cdot}7273125
\end{array}$$

£533, 14s. 4¼d.

(19) $a_{19} = 18\cdot488,\ a_{34} = 16\cdot219,\ 1\cdot04^{-15} = \cdot5552645$

$$\begin{array}{lrcl}
 & \log.\ 16\cdot219 & = & 1\cdot2100241 \\
 & \log.\ \cdot5552645 & = & \bar{1}\cdot7444999 \\
 & \log.\ 5417 & = & 3\cdot7337588 \\
\text{A. C.} & \log.\ 6133 & = & \underline{6\cdot2123270} \\
 & \log.\ 7\cdot95444 & = & 0\cdot9006098
\end{array}$$

$$\begin{array}{rr}
a_{19} = & \underline{18\cdot488} \\
 & 10\cdot53356 \\
 & \underline{30} \\
 & 316\cdot0068 = £316,\ 0s.\ 1\tfrac{1}{2}d.
\end{array}$$

(20)

$$\text{P. V.} = \left(\frac{1}{\cdot04} - a_{64}\right) \times 1721\cdot5$$

$$\begin{array}{rr}
\frac{1}{\cdot04} = & 25\cdot \\
a_{64} = & 8\cdot593 \\ \hline
 & 16\cdot407000 \\
 & 5\cdot1271 \\ \hline
 & 28244\cdot650 \\ \hline
 & £28244\ \ 13
\end{array}$$

(21)

$$\text{P. V.} = \left(\frac{1}{\cdot03} - a_{35,40}\right) \times 1721\cdot5$$

$$\begin{array}{rr}
\frac{1}{\cdot03} = & 33\cdot333\dot{3} \\
a_{35,40} = & 14\cdot048 \\ \hline
 & 19\cdot2853333 \\
 & 5\cdot1271 \\ \hline
 & 33199\cdot7013 \\ \hline
 & £33199\ \ 14\ \ 0\tfrac{1}{4}
\end{array}$$

(22)

$$\begin{array}{rr}
a_{29} = & 19\cdot761 \\
 & \cdot03 \\ \hline
 & \cdot59283 \\
 & 1\cdot\ \ \ \ \ \ \\ \hline
 & \cdot40717 \\
1\cdot03^{-1}\ \text{inverted,} & 378079\cdot \\ \hline
 & \cdot395310 \\
 & 573\cdot937 \\ \hline
 & 292\cdot2824 \\ \hline
 & £292\ \ 5\ \ 7\tfrac{3}{4}
\end{array}$$

$$\text{An. prem.} = \frac{292\cdot282}{20\cdot761} = 14\cdot078$$
$$= £14,\ 1s.\ 6\tfrac{3}{4}d.$$

(23)

$$\begin{array}{rr}
a_{55,60} = & 7\cdot574 \\
 & \cdot04 \\ \hline
 & \cdot30296 \\
 & 1\cdot\ \ \ \ \ \ \\ \hline
 & \cdot69704 \\
1\cdot04^{-1} = & 835169\cdot \\ \hline
 & \cdot670231 \\
 & 0032 \\ \hline
 & 1541\cdot531 \\ \hline
 & £1541\ \ 10\ \ 7\tfrac{1}{2}
\end{array}$$

(24)

$$\begin{array}{rcr}
a_{25} & = & 17{\cdot}645 \\
a_{30} & = & 16{\cdot}852 \\ \cline{3-3}
 & & 34{\cdot}497 \\
a_{25,\,30} & = & 14{\cdot}339 \\ \cline{3-3}
 & & 20{\cdot}158 \\
 & & {\cdot}04 \\ \cline{3-3}
 & & {\cdot}80632 \\
 & & 1{\cdot} \\ \cline{3-3}
 & & {\cdot}19368 \\
1{\cdot}04^{-1} & = & 835169{\cdot} \\ \cline{3-3}
 & & {\cdot}186231 \\
 & & 576{\cdot}968 \\ \cline{3-3}
 & & 161{\cdot}961
\end{array}$$

$$\text{An. prem.} = \frac{161{\cdot}961}{15{\cdot}339} = 10{\cdot}559$$
$$= £10,\ 11s.\ 2\tfrac{1}{4}d.$$

(25)

$$\begin{array}{rcr}
a_{51} & = & 11{\cdot}410 \\
 & & {\cdot}05 \\ \cline{3-3}
 & & {\cdot}57050 \\
 & & 1{\cdot} \\ \cline{3-3}
 & & {\cdot}42950 \\
1{\cdot}05^{-1} & = & 583259{\cdot} \\ \cline{3-3}
 & & {\cdot}409049 \\
 & & 0001 \\ \cline{3-3}
 & & £409{\cdot}049
\end{array}$$

$$\text{An. prem.} = \frac{409{\cdot}049}{12{\cdot}410} = 32{\cdot}961$$
$$= £32,\ 19s.\ 2\tfrac{3}{4}d.$$

(26)

$$\begin{array}{rcr}
a_{30} & = & 19{\cdot}556 \\
 & & {\cdot}03 \\ \cline{3-3}
 & & {\cdot}58668 \\
 & & 1{\cdot} \\ \cline{3-3}
 & & {\cdot}41332 \\
1{\cdot}03^{-1} & = & 378079 \\ \cline{3-3}
 & & {\cdot}401281 \\
 & & 053 \\ \cline{3-3}
 & & 140{\cdot}448
\end{array}$$

$$\text{An. prem.} = \frac{140{\cdot}448}{20{\cdot}556} = 6{\cdot}832 = £6,\ 16s.\ 7\tfrac{3}{4}d.$$

MISCELLANEOUS EXERCISES.

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(1)

$$\text{P.V.} = 1560 \times 1{\cdot}04^{-9} \times \frac{6047}{6400}$$

$$= 1560 \times {\cdot}7025867 \times \frac{6047}{6400}$$

$$\begin{array}{r} {\cdot}702586700 \\ 0651 \\ \hline 1096{\cdot}035252 \\ 7406 \\ \hline 6400\big)6627725{\cdot}168 \\ \hline 1035{\cdot}582 \\ \hline \text{£}1035\quad 11\quad 7\tfrac{3}{4} \end{array}$$

$$\begin{array}{rl} \text{log. } 1560 & = 3{\cdot}1931246 \\ \text{log. } {\cdot}7025867 & = \bar{1}{\cdot}8466999 \\ \text{log. } 6047 & = 3{\cdot}7815400 \\ \text{A. C. log. } 6400 & = 6{\cdot}1938200 \\ \hline \text{log. } 1035{\cdot}582 & = 3{\cdot}0151845 \end{array}$$

£1035, 11s. 7¾d.

(2)

$$\begin{array}{rr} a_{45} = & 15{\cdot}863 \\ a_{50} = & 14{\cdot}303 \\ \hline & 30{\cdot}166 \\ a_{45,50} = & 11{\cdot}580 \\ \hline & 18{\cdot}586 \\ & {\cdot}03 \\ \hline & {\cdot}55758 \\ & 1{\cdot} \\ \hline & {\cdot}442420 \\ 1{\cdot}03^{-1} = & 8378079{\cdot} \\ \hline & {\cdot}4295340 \\ & 0007 \\ \hline & 3006{\cdot}738 \end{array}$$

$$\text{An. prem.} = \frac{3006{\cdot}738}{12{\cdot}580} = 239{\cdot}009$$

$$= \text{£}239,\ 0\text{s. } 2\tfrac{1}{4}\text{d.}$$

(3)

$$\text{P.V.} = (a_{37} - a_{37,40}) \times 120$$

$$\begin{array}{rr} a_{37} = & 13{\cdot}843 \\ a_{37,40} = & 11{\cdot}206 \\ \hline & 2{\cdot}637 \\ & 120 \\ \hline & 316{\cdot}440 \\ \hline & \text{£}316\quad 8\quad 9\tfrac{1}{2} \end{array}$$

(4)

$$\text{An. prem.} = \frac{(a_{30} - a_{30,35}) \times 400}{1 + a_{30,35}}$$

$$\begin{array}{rr} a_{30} = & 16{\cdot}852 \\ a_{30,35} = & 13{\cdot}491 \\ \hline & 3{\cdot}361 \\ & 400 \\ \hline 14{\cdot}491\big) & 1344{\cdot}400 \\ \hline & 92{\cdot}774 \\ \hline & \text{£}92\quad 15\quad 5\tfrac{3}{4} \end{array}$$

(5)

$\text{P.V.} = a_{55,70} \times 250 = 6{\cdot}019 \times 250$
$= 1504{\cdot}750 = £1504,\ 15s.$

(6)

$\text{P. V.} = (a_{30} - a_{30,86}) \times 420$

$a_{30} = 16{\cdot}852$
$a_{30,86} = 2{\cdot}867$

13·985
420

5873·700

£5873 14 0

(7)

$a_{47} = 13{\cdot}662$
·04

·54648
1·

·453520
$1{\cdot}04^{-1} = 5835169{\cdot}$

·4360769
0002

872·154
Subtract 500
14·662)372·154
25·382

£25 7 7¾

(8)

$$\text{P. V.} = \left(\frac{1}{{\cdot}05} - a_{61}\right) \times 827$$

$\frac{1}{{\cdot}05} = 20{\cdot}$
$a_{61} = 8{\cdot}712$

11·288
827

9335·176

£9335 3 6¼

(9)

$$\text{Annuity} = \frac{400}{a_{41} \times 1{\cdot}03^{-9} \times \frac{5009}{5528}}$$

$a_{41} = 16{\cdot}890;\ 1{\cdot}03^{-9} = {\cdot}7664167$

log. 16·890 $= 1{\cdot}2276296$
log. ·7664167 $= \bar{1}{\cdot}8844650$
log. 5009 $= 3{\cdot}6997510$
A.C. log. 5528 $= 6{\cdot}2574320$

Subtract . $1{\cdot}0692776$
from log. 400 $= 2{\cdot}6020600$

log. 34·102 $= 0{\cdot}5327824$
or £34, 2s. 0½d.

(10)

$$\text{An. pr.} = \frac{(a_{30} - a_{30,43}) \times 75 - 10}{1 + a_{30,43}}$$

$a_{30} = 16{\cdot}852$
$a_{30,43} = 12{\cdot}526$

4·326
75

324·450
10

13·526)314·450
23·2478

£23 4 11¼

(11)

$$\text{An. prem.} = \frac{a_{65} \times 1{\cdot}04^{-25} \times \frac{3018}{5075} \times 200}{1 + a_{40} - \left(a_{65} \times 1{\cdot}04^{-25} \times \frac{3018}{5075}\right)}$$

$a_{65} = 8{\cdot}307$; $1{\cdot}04^{-25} = {\cdot}3751168$

$a_{40} = 15{\cdot}074$

	log. 8·307	=	0·9194442
	log. ·3751168	=	$\bar{1}{\cdot}5741664$
	log. 3018	=	3·4797192
A. C.	log. 5075	=	6·2945640
	log. 1·853	=	0·2678938

$$\begin{array}{r} 15{\cdot}074 \\ \hline 13{\cdot}221 \end{array}$$

$$\therefore \text{ An. prem.} = \frac{1{\cdot}853 \times 200}{1 + 13{\cdot}221} = \frac{370{\cdot}600}{14{\cdot}221} = 26{\cdot}060 = \text{£}26,\ 1\text{s. } 2\tfrac{1}{2}\text{d.}$$

(12) Annuity during the surviving life, $= \dfrac{2000}{a_{27} + a_{35}} =$

$$\frac{2000}{15{\cdot}065 + 14{\cdot}127} = \frac{2000}{29{\cdot}192} = 68{\cdot}511 = \text{£}68,\ 10\text{s. } 2\tfrac{3}{4}\text{d.}$$

Annuity during their joint lives, $=$ £137, 0s. $5\tfrac{1}{2}$d.

EXCHANGE.

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(1) 1 : 160 : : 25 fr. 70 ct. : 4112 fr.

(2) £1 : £750 15s. : : 25 fr. 40 ct. : 19069 fr. 5 ct.

(3) 6470 milreas at 4s. 4d. = £1401 16s. 8d.

(4) 1 : 7600·9 : : 12·275 fl. : 93301·0475 fl. = 93301 fl. $4\tfrac{3}{4}$ ct.

(5) 12·1375 : 6854·64 : : £1 £564 14s. $11\tfrac{1}{2}\ \tfrac{234}{971}$d.

(6) $1 : 2500 :: \overset{\text{mk.}}{13}\ \overset{\text{sch.}}{12\frac{3}{4}} : \overset{\text{mk.}}{34492}\ \overset{\text{sch.}}{3}$

(7) $\overset{s.}{20} : \overset{s.}{4\frac{1}{2}} :: \overset{\text{dol.}}{5110}$

$109\frac{1}{2} : 100$

$$\frac{5110 \times 4\frac{1}{2} \times 100}{20 \times 109\frac{1}{2}} = 210 \times 5 = \overset{\pounds}{1050}$$

(8) $\overset{s.}{4}\ \overset{d.}{6} : \overset{\pounds}{760} :: \overset{\$}{1}$

$100 : 110$

$$\frac{182400 \times 110}{54 \times 100} = \frac{304 \times 110}{9} = \frac{33440}{9} = \overset{\$}{3715}\ \overset{\text{ct.}}{55\frac{5}{9}}$$

(9) $\overset{s.}{4}\ \overset{d.}{10} : \overset{\pounds}{1600} :: \overset{\text{milrea.}}{1} : \overset{\text{mil.}}{6620}\ \overset{\text{reas.}}{689\frac{19}{29}}$

(10) 6230 duc. di reg. at 3s. 11d. $= \overset{\pounds}{1220}\ \overset{s.}{0}\ \overset{d.}{10}$

(11) $\overset{\pounds}{1} : \overset{\pounds}{375}\ \overset{s.}{18}\ \overset{d.}{6} :: \overset{\text{fl.}}{10}\ \overset{\text{cr.}}{3} : \overset{\text{fl.}}{3778}\ \overset{\text{cr.}}{2\frac{31}{40}}$

(12) $\overset{\text{fl.}}{9}\ \overset{\text{cr.}}{50} : \overset{\text{fl.}}{7832}\ \overset{\text{cr.}}{45} :: \overset{\pounds}{1} : \overset{\pounds}{796}\ \overset{s.}{11}\ \overset{d.}{0\frac{0}{4}}\ \frac{48}{59}$

(13) $\overset{\text{lir.}}{6} : \overset{\text{lir.}}{8643}\ \overset{\text{cent.}}{75} :: \overset{d.}{50\frac{1}{2}} : \overset{\pounds}{303}\ \overset{s.}{2}\ \overset{d.}{7\frac{1}{2}}\ \frac{1}{4}$

(14) $\overset{d.}{47} : \overset{\pounds}{623}\ \overset{s.}{11}\ \overset{d.}{6} :: \overset{\text{lir.}}{6} : \overset{\text{lir.}}{19105}\ \overset{\text{cent.}}{27}\ \frac{31}{47}$

(15) $\overset{\text{fr.}}{25{\cdot}46} : \overset{\text{fr.}}{7467{\cdot}80} :: \overset{\pounds}{1} : \overset{\pounds}{293}\ \overset{s.}{6}\ \overset{d.}{3\frac{1}{2}}\ \frac{514}{1273}$

(16) $1 : 840{\cdot}575 :: \overset{\text{fr.}}{25{\cdot}25} : \overset{\text{fr.}}{21224}\ \overset{\text{ct.}}{51\frac{7}{8}}$

(17) $\overset{\text{bat.}}{150\frac{3}{4}} : \overset{\text{fl.}}{1253}\ \overset{\text{bat.}}{10} :: \overset{\pounds}{1} \cdot \overset{\pounds}{124}\ \overset{s.}{14}\ \overset{d.}{10\frac{1}{4}}\ \frac{47}{201}$

lir. lir. cent.
(18) 1 : 572·525 : : 25·80 : 14771 $14\frac{1}{2}$

£ £ s. d.
(19) 25·70 : 6052·75 : : 1 : 235 10 $3\frac{1}{2}\ \frac{242}{257}$

s. d. £ s. d. r. r. an.
(20) 2 $1\frac{1}{2}$: 638 17 5 : : 1 : 6012 14 $\frac{22}{51}$

r. r. an. s. d. £ s. d.
(21) 1 : 7965 12 : : 1 $11\frac{3}{4}$: 788 5 $6\frac{1}{2}\ \frac{1}{4}$

£ £ s. d. ru. cop. ru. cop.
(22) 1 : 712 16 8 : : 6 60 : 4704 70

£ £ s. d.
(23) 6·40 : 3296·85 : : 1 : 515 2 $7\frac{3}{4}\ \frac{1}{2}$

£ £ s. d. mk. sch. mk. sch.
(24) 1 : 3276 15 6 : : 13 $12\frac{1}{2}$: 45158 $0\frac{71}{80}$

mk. sch. mk. sch. £ £ s. d.
(25) 13 $9\frac{3}{4}$: 9127 13 : : 1 : 670 14 $0\frac{0}{4}\ \frac{288}{871}$

s. d. £ s. d. $
(26) 4 6 : 5327 14 8 : 1
100 : 108

$$\frac{1278656\times 108}{54\times 100}=\frac{1278656\times 2}{100}=\$25573,\ 12$$

s. d.
(27) 1 : 8239·24 : 4 6
12

104 : 100 £$\frac{54}{240}$

$$\frac{8239{\cdot}24\times 100\times 54}{104\times 240}=\frac{205981\times 9}{104\times 10}=\overset{\pounds}{\frac{1853829}{1040}}=\overset{\pounds}{1782}\ \overset{s.}{10}\ \overset{d.}{6\frac{1}{2}}\ \frac{10}{13}$$

SINGLE POSITION.

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(1) Suppose 14

$$\frac{14 \times 2}{7} = 4, \therefore 4 : 16 :: 14 : 56$$

(2) Suppose C's age = 4
... B's ... = 12
... A's ... = 24

Sum, = 40

$\therefore$ 40 : 150 :: 4 : 15 = C's age.
$\therefore$ B's age = 45; A's = 90

(3)
£
Suppose he had 20
His tailor gets 10

10
Shoemaker gets 5

Remainder 5

£ £ *s.* £ £
$\therefore$ 5 : 8 15 :: 20 : 35

(4) Suppose 40
$\frac{1}{5}$ of 40 = 8
$\frac{1}{8}$ of 40 = 5

53
$\frac{1}{2}$ of 53 = $26\frac{1}{2}$

Remainder = $26\frac{1}{2}$
$\therefore$ $26\frac{1}{2}$: 106 :: 40 : 160

(5)
£
Let A's share = 4
... B's ... = 5
... C's ... = 6

Sum = 15

£ *s.* *d.*
15 : 1000 : 4 : 266 13 4
15 : 1000 : 5 : 333 6 8
15 : 1000 : 6 : 400 0 0

(6) Suppose she first bought 30.

$$\left.\begin{array}{ccccccc} & & & & d. & & d. \\ 2 & : & 30 & :: & 1 & : & 15 \\ 2 & : & 30 & :: & 1 & : & 10 \end{array}\right\} = \text{prime cost.}$$

$$5 : 60 :: 2 : 24 = \text{sell. price.}$$

$$\therefore\ 25 - 24 = \overset{d.}{1} = \text{her loss.}$$

$$\therefore\ 1 : 8 :: 30 : 240$$

2

∴ The whole number bought = 480

DOUBLE POSITION.

Page 251.

(7) Suppose 29 — 5 — 24; $\frac{7}{8}$ of 24 = 21; 35 — − 14

Suppose 61 — 5 — 56; $\frac{7}{8}$ of 56 = 49; 35 — + 14

$$\begin{array}{rr} \text{Suppose} & 29 \\ & 5 \\ \hline & 24 \\ \frac{7}{8}\text{ of }24 = & 21 \\ & 35 \\ \hline - & 14 \end{array} \qquad \begin{array}{rr} \text{Suppose} & 61 \\ & 5 \\ \hline & 56 \\ \frac{7}{8}\text{ of }56 = & 49 \\ & 35 \\ \hline + & 14 \end{array}$$

∴ 14 + 14 : 61 — 29 :: 14 : 16 correction of the first supposition.

29 first supposition.

∴ 45 is the number required.

(8)

$$\begin{array}{lr} \text{Suppose} & 12 \\ \frac{1}{3}\text{ of }12 = 4 & \\ \frac{1}{4}\text{ of }12 = 3 & \\ \qquad\quad - & 7 \\ \hline & 5 \\ & 10 \\ \hline - & 5 \end{array} \qquad \begin{array}{lr} \text{Suppose} & 48 \\ \frac{1}{3}\text{ of }48 = 16 & \\ \frac{1}{4}\text{ of }48 = 12 & \\ \qquad\quad - & 28 \\ \hline & 20 \\ & 10 \\ \hline + & 10 \end{array}$$

∴ 10 + 5 : 48 — 12 :: 5 : 12

12

∴ 24 length of the post.

(9) Suppose		5	Suppose		7
		21			21
		105			147
Sub.		39			89
	17)	66		17)	108
		$3\frac{15}{17}$			$6\frac{6}{17}$
Number	=	5	Number	=	7
∴	—	$1\frac{2}{17}$		—	$0\frac{11}{17}$

$1\frac{2}{17} - 0\frac{11}{17} : 7 - 5 :: 1\frac{2}{17}$: or

$8 : 2 :: 19 : 4\frac{3}{4}$ correction.

5

∴ The number is $9\frac{3}{4}$

		s.			*s.*
(10) Suppose 40 at 9*s.*	=	360	Suppose 30 at 9*s.*	=	270
∴ 60 at 13*s.*	=	780	∴ 70 at 13*s.*	=	910
		1140			1180
100 at 12*s.*	=	1200	100 at 12*s.*	=	1200
	—	60		—	20

60 — 20 : 40 — 30 : : 60 : 15 correction.

40

25 at 9*s.*

and 100 — 25 = 75 at 13*s.*

	£		£
(11) Suppose A gets	5	Suppose A gets	10
B gets 2 × 5 + 6 =	16	B = 2 × 10 + 6 =	26
C gets 5 + 16 + 20 =	41	C = 10 + 26 + 20 =	56
	62		92
	1000		1000
	— 938		— 908

938 — 908 : 10 — 5 : : £938 : £156 6*s.* 8*d.* correction.

5

£161 6*s.* 8*d.* = A's share.

£161 6*s.* 8*d.* × 2 + £6 = 328 13 4 = B's ...

£161 6*s.* 8*d.* + £328 13*s.* 4*d.* + £20 = 510 0 0 = C's ...

$$\begin{array}{lrlr}
 & \text{days.}\quad\ \ \text{s.} & & \text{days.}\quad\ \ \text{s.} \\
\text{(12) Suppose he works } 20 \text{ at } 4s. = & 80; & \text{Suppose } 25 \text{ at } 4s. = & 100 \\
\therefore\ \text{He is idle } 10 \text{ at } 5s. = & \underline{50} & 5 \text{ at } 5s. = & \underline{25} \\
 & 30 & & 75 \\
\text{He receives} & \underline{39} & & \underline{39} \\
 & -\ 9 & & +\ 36
\end{array}$$

$$\begin{array}{ll}
36 + 9 : 25 - 20 :: 9 : & 1 \quad \text{correction.} \\
 & \underline{20} \\
 & 21 = \text{number of days he works.}
\end{array}$$

ALLIGATION.

Page 253.

$$\begin{array}{lrcrcr}
(1) & 24 & \times & 6 & = & 144 \\
 & 20 & \times & 5 & = & 100 \\
 & \underline{30} & \times & 4\frac{1}{2} & = & \underline{135} \\
 & 74) & & & & 379\ (5\frac{9}{74}\ s. = 5s.\ 1\frac{1}{4}d.\ \frac{31}{37} \\
 & & & & & \underline{370} \\
 & & & & & 9
\end{array}$$

$$\begin{array}{lrcrcr}
(2) & 10 & \times & 7 & = & 70 \\
 & 18 & \times & 8\frac{1}{2} & = & 153 \\
 & \underline{15} & \times & 5\frac{5}{6} & = & \underline{87\frac{1}{2}} \\
 & 43) & & & & 310\frac{1}{2}\ (7\frac{19}{86} = 7s.\ 2\frac{1}{2}d.\ \frac{26}{43} \\
 & & & & & \underline{301} \\
 & & & & & 9\frac{1}{2}
\end{array}$$

$$\begin{array}{lrcrcr}
(3) & 4 & \times & 58 & = & 232 \\
 & 10 & \times & 63 & = & 630 \\
 & \underline{16} & \times & 68 & = & \underline{1088} \\
 & 30) & & & & \underline{1950} \\
 & & & & & 65\ \text{pence} = 5s.\ 5d.
\end{array}$$

$$\begin{array}{lrcrcr}
(4) & 18 & \times & 12\frac{1}{2} & = & 225 \\
 & 24 & \times & 10\frac{1}{2} & = & 252 \\
 & 12 & \times & 9 & = & 108 \\
 & \underline{30} & \times & 8\frac{1}{2} & = & \underline{255} \\
 & 84) & & & & 840\ (10s.
\end{array}$$

(5)

$$\begin{array}{rcrcl} 7 & \times & 22 & = & 154 \\ 10 & \times & 21 & = & 210 \\ 19 & \times & 19 & = & 361 \\ \hline 36) & & & & \overline{725}\ (20\tfrac{5}{36} \\ & & & & \underline{720} \\ & & & & \quad 5 \end{array}$$

(6)

$$\begin{array}{rcrcl} 25 & \times & 40 & = & 1000 \\ 36 & \times & 44 & = & 1584 \\ 16 & \times & 48 & = & 768 \\ 15 & \times & 54 & = & 810 \\ 18 & \times & 60 & = & 1080 \\ \hline 110) & & & & \overline{5242} = \overset{s.}{47}\ \ \overset{d.}{7\tfrac{3}{4}}\,\tfrac{23}{55} \\ & & & & \overline{110} \end{array}$$

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(7)

$$20s.\left\{\begin{array}{l} 16 \\ 18 \\ 23 \end{array}\right.\begin{array}{rcl} 3 & = & 3 \\ 3 & = & 3 \\ 2 + 4 & = & 6 \end{array}\left.\vphantom{\begin{array}{l}1\\1\\1\end{array}}\right\}\text{ or }\left\{\begin{array}{l} 1 \\ 1 \\ 2 \end{array}\right.$$

(8) 2*s.* 8*d.* = 32*d.*, 3*s.* 4*d.* = 40*d*, 3*s.* 8*d.* = 44*d.*, and 4*s.* = 48*d.*; value of the compound 3*s.* 6*d.* = 42*d.*

$$42\left\{\begin{array}{l} 32 \\ 40 \\ 44 \\ 48 \end{array}\right.\begin{array}{rr} = & 6 \\ = & 2 \\ = & 2 \\ = & 10 \end{array}\qquad 42\left\{\begin{array}{l} 32 \\ 40 \\ 44 \\ 48 \end{array}\right.\begin{array}{rcr} 2 & = & 2 \\ 6 + 2 & = & 8 \\ 10 + 2 & = & 12 \\ 2 & = & 2 \end{array}\qquad 42\left\{\begin{array}{l} 32 \\ 40 \\ 44 \\ 48 \end{array}\right.\begin{array}{rr} = & 2 \\ = & 6 \\ = & 10 \\ = & 2 \end{array}$$

(9) 4*d.* = 16*f.*, 6*d.* = 24*f.*, 7½*d.* = 30*f.*, and 5¾*d.* = 23*f.*

$$23\left\{\begin{array}{l} 16 \\ 24 \\ 30 \end{array}\right.\begin{array}{lcr} = 1 + 7 & = & 8 \\ = 7 & = & 7 \\ = \quad\ \ 7 & = & 7 \end{array}$$

(10)

$$17\left\{\begin{array}{l} 24 \\ 22 \\ 20 \\ 15 \end{array}\right.\begin{array}{rcrcl} = \qquad\qquad\ \ 2 & = & 2 \times 3 & = & 6 \\ = \qquad\ \ 2 \qquad & = & 2 \times 3 & = & 6 \\ = 2 \qquad\qquad\quad & = & 2 \times 3 & = & 6 \\ = 3 + 5 + 7 & = & 15 \times 3 & = & 45 \end{array}\left.\vphantom{\begin{array}{l}1\\1\\1\\1\end{array}}\right\}\text{ Ans.}$$

$$\overline{21} : 63 :: 1 : 3$$

(11) 18*s.* = 36 sixpences, 10*s.* 6*d.* = 21 sixpences, 6*s.* = 12 sixpences, and 12*s.* = 24 sixpences.

$$24\left\{\begin{array}{l}36\\21\\12\end{array}\right. \left.\begin{array}{lrr} = & 3+12 & = 15\\ = 12 & & = 12\\ = & 12 & = 12\end{array}\right\} \text{ or } \left\{\begin{array}{lr} 3\times 4+12\times 3 & = 48\\ 12\times 4 & = 48\\ & 12\times 3 = 36\end{array}\right.$$

This answer is got by taking the first linking 4 times, and the second 3 times; the second answer will be found by taking the first linking 5⅓ times, and the second 2⅔ times. By a similar process, other answers may be obtained.

(12) 5*s.* = 20 threepences, 4*s.* 6*d.* = 18 threepences, 3*s.* = 12 threepences, 4*s.* = 16 threepences, and 4*s.* 3*d.* = 17 threepences.

$$16\left\{\begin{array}{l}20\\18\\12\end{array}\right. \begin{array}{lrl} = & 4 = & 4\times 2 = 8\\ = 4 & = & 4\times 2 = 8\\ = 2 + & 4 = & \underline{6}\times 2 = \underline{12}\\ & 14\overline{)28} & \quad\ \ 28 \text{ lb. the sum.}\\ \text{the multiplier} = & \overline{2} & \end{array}$$

$$17\left\{\begin{array}{l}20\\18\\12\end{array}\right. \begin{array}{lrl} = & 5 = & 5\times 4 = 20\\ = 5 & = & 5\times 4 = 20\\ = 1 + & 3 = & \underline{4}\times 4 = \underline{16}\\ & 14\overline{)56} & \quad\ \ 56 \text{ lb. the sum.}\\ \text{the multiplier} = & \overline{4} & \end{array}$$

(13) 6*s.* = 24 threepences, 5*s.* = 20 threepences, 4*s.* 6*d.* = 18 threepences, 4*s.* = 16 threepences, and 4*s.* 9*d.* = 19 threepences.

$$19\left\{\begin{array}{l}24\\20\\18\\16\end{array}\right. \begin{array}{l} = 3\times 10 = 30\\ = 1 \qquad\quad\ = 1\\ = 1 \qquad\quad\ = 1\\ = 5\times 10 = 50\end{array}$$

or any equal quantities whatever.

MENSURATION.

MISCELLANEOUS EXERCISES.

Page 260.

(1) $\overset{\text{ft.}}{42}\ \overset{\text{in.}}{8} \times \overset{\text{ft.}}{31}\ \overset{\text{in.}}{10} = \overset{\text{ft.}}{1358}\ \overset{\prime}{2}\ \overset{\prime\prime}{8}$ = content of the floor.

Expense.

$\overset{\text{ft.}}{1358}\ \overset{\prime}{2\tfrac{2}{3}}$, at 2s. 4½d. per sq. yd. = $\overset{£}{17}\ \overset{s.}{18}\ \overset{d.}{5\tfrac{1}{27}}$

In calculations of this kind, it is best to find the value at 2s. 4½d. per sq. ft., and then to take $\tfrac{1}{9}$ of the result for the value, at 2s. 4½d. per sq. yd.; thus,

$$
\begin{array}{r|rr}
 & s. & d. \\
 & 1358 & 2\tfrac{2}{3} \\
 & & 2 \\
\hline
 & 2716 & 5\tfrac{1}{3} \\
4d. = \tfrac{1}{3} \text{ of } 1s. & 452 & 8\tfrac{8}{9} \\
\tfrac{1}{2}d. = \tfrac{1}{8} \text{ of } 4d. & 56 & 7\tfrac{1}{9} \\
\hline
9 & 3225 & 9\tfrac{1}{3} \\
\hline
20) & 35{,}8 & 5\tfrac{1}{27} \\
\hline
 & £17\ \ 18 & 5\tfrac{1}{27}
\end{array}
$$

(2) $\overset{\text{ft.}}{7}\ \overset{\text{in.}}{8} \times \overset{\text{ft.}}{3}\ \overset{\text{in.}}{6}\ \overset{\prime\prime}{6} = \overset{\text{ft.}}{27}\ \overset{\prime}{1}\ \overset{\prime\prime}{10}$ = sq. ft. glass.

Expense.

$\therefore \overset{\text{ft.}}{27}\ \overset{\prime}{1\tfrac{5}{6}}$, at 1s. 8d. per sq. ft. = $\overset{£}{2}\ \overset{s.}{5}\ \overset{d.}{3\tfrac{1}{18}}$

(3) $\overset{\text{ft.}}{6}\ \overset{\text{in.}}{8} = \overset{\text{in.}}{80}$; $\overset{\text{ft.}}{3}\ \overset{\text{in.}}{10} = \overset{\text{in.}}{46}$; $\overset{\text{ft.}}{5}\ \overset{\text{in.}}{4} = \overset{\text{in.}}{64}$; and 277·274 cu. in. = 1 imperial gallon.

$$\therefore \frac{80 \times 46 \times 64}{277{\cdot}274} = \frac{235520}{277{\cdot}274} = \overset{\text{gal.}}{849\tfrac{57187}{138637}}$$

(4) $\overset{\text{ft.}}{20} \times \overset{\text{ft.}}{14} \times \overset{\text{ft.}}{10\tfrac{1}{2}} = \overset{\text{so. ft.}}{2940}$; $\overset{\text{so. ft.}}{2940}$, at 2s. 3d. per so. yd. = $\overset{£}{12}\ \overset{s.}{5}$

(5) $(\overset{\text{ft.}}{6} + \overset{\text{ft.}}{4}) \times 2 = \overset{\text{ft.}}{10} \times 2 = \overset{\text{ft.}}{20}$ = the perimeter of the box.

$$
\begin{array}{l}
\therefore 20 \times 3 = \overset{\text{sq. ft.}}{60} = \text{content of the sides and ends.} \\
\quad\ \ 6 \times 4 = \underline{24} = \quad \ldots \quad \ldots \quad \text{bottom.} \\
\qquad\qquad\ \ \ 84
\end{array}
$$

$$\frac{72 \times 48 \times 36}{2218{\cdot}192} = \frac{124416}{2218{\cdot}192} = \overset{\text{bush.}}{56\tfrac{12328}{138637}}$$

ft. in. ft. in. ft. in. ft. in.
(6) (45 6 + 24 10) × 2 = 70 8 × 2 = 140 8 = perimeter of the room.
ft. in. ft. in. sq. ft. ′ ″
∴ 140 8 × 13 4 = 1875 6 8 = content of the walls.
45 6 × 24 10 = 1129 11 = ... ceiling.

EXPENSE.

ft. ′			£	s.	d.
1875 $6\frac{2}{3}$	at $10\frac{1}{2}$d. per sq. yd.	=	9	2	$4\frac{4}{27}$
1129 11	at $1\frac{1}{2}$d. ...	=	0	15	$8\frac{23}{72}$
	Whole expense,	=	£9	18	$0\frac{101}{216}$

ft. in. ft. in. sq. ft. ″
(7) 68 4 × 60 6 = 4134 2 = content of the court.

EXPENSE.

4134 ft. 2′ at $3\frac{1}{4}$d. per sq. yd. = £6, 4s. $4\frac{3}{4}$d. $\frac{31}{24}$

ft. in. ft. in. ft. ′ ″
(8) 7 9 × 3 8 × 5 = 142 1 0 = first tier.
6 10 × 3 8 × 5 = 125 3 4 = second tier.
5 6 × 3 8 × 5 = 100 10 0 = third tier.
368 2 4

Or thus,

ft. in. ft. in. ft. in. ft. in. ft. in. ft. in. ft. ′ ″
(7 9 + 6 10 + 5 6) × 3 8 × 5 = 20 1 × 3 8 × 5 = 368 2 4

EXPENSE.

368 ft. $2'\frac{1}{3}$ at 1s. 6d. per sq. ft. = £27, 12s. $3\frac{1}{2}$d.

ft. in. ft. in. sq. ft. ′
(9) 60 0 × 30 0 × 4 = 7200 0
12 4 × 8 6 × 4 = 419 4 = vacancies for the stair.
6780 8

EXPENSE.

6780 ft. 8′ at 3s. 6d. per sq. yd. = £131, 16s. $11\frac{1}{8}$d.

ft. in. ft. in. ft. ft.
(10) (32 6 + 16 6) × 2 = 49 × 2 = 98 = perimeter of the room.
ft. in. ft. in. sq. ft. ′
98 0 × 9 3 = 906 6 = content of the walls.
32 6 × 16 6 = 536 3 = ... roof.
1442 9
6 6 × 3 0 = 19 6 = ... door.
1423 3

EXPENSE.

1423 ft. 3′ at $4\frac{1}{2}$d. per sq. yd. = £2, 19s. $3\frac{1}{2}$d. $\frac{1}{2}$

(11) $$\overset{\text{ft.}}{50} \times \overset{\text{ft.}}{32} = \overset{\text{sq. ft.}}{1600} = 230'400$$

$$\overset{\text{ft.}}{12}\ \overset{\text{in.}}{6} \times \overset{\text{in.}}{8\tfrac{1}{2}} = \overset{\text{ft.}}{8}\ 10'\ 8'' = 12''75$$

$$\therefore \frac{230400}{1275} = 180\tfrac{12}{17}$$

(12) $$(\overset{\text{ft.}}{2}\ \overset{\text{in.}}{10} + \overset{\text{ft.}}{2}) \times 2 = \overset{\text{ft.}}{4}\ \overset{\text{in.}}{10} \times 2 = \overset{\text{ft.}}{9}\ \overset{\text{in.}}{8} = \text{perimeter.}$$

$$\overset{\text{ft.}}{9}\ \overset{\text{in.}}{8} \times \overset{\text{ft.}}{2}\ \overset{\text{in.}}{6} = \overset{\text{ft.}}{24}\ 2' = \text{contents of the sides and ends.}$$

$$2\ 10 \times 2\ 0 = 5\ 8 = \text{〃 〃 bottom.}$$

$$\overline{29\ 10}$$

$$\overset{\text{lb.}}{10} \times 29\tfrac{5}{6} = \overset{\text{lb.}}{298\tfrac{1}{3}} = \text{quantity of lead.}$$

EXPENSE.

298⅓ lb. at £1, 18*s.* 9*d.* per cwt. = £5, 3*s.* 2½*d.* $\tfrac{13}{28}$

(13) $$\frac{46\tfrac{1}{2} \times 37\tfrac{1}{2} \times 7\tfrac{3}{4}}{27} = \frac{93 \times 75 \times 31}{2 \times 2 \times 4 \times 27} = \frac{31 \times 25 \times 31}{48}$$

$$= 500\tfrac{25}{48} \text{ yds.}$$

EXPENSE.

$$£500\tfrac{25}{48} \times \frac{1}{10} = £50\tfrac{5}{96} = £50,\ 1s.\ 0\tfrac{1}{2}d.$$

(14) $$\frac{25\tfrac{1}{2} \times 19\tfrac{1}{2}}{9} = \frac{51 \times 39}{4 \times 9} = \frac{17 \times 13}{4} = \frac{221}{4} = 55\tfrac{1}{4} \text{ yds.}$$

EXPENSE.

$$3s.\ 4d. = £\tfrac{1}{6} = 55\tfrac{1}{4} \times \tfrac{1}{6} = \frac{221}{24} = £9,\ 4s.\ 2d.$$

MISCELLANEOUS QUESTIONS.

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		£
(1)	Customs,	22464353
	Excise,	17472000
	Stamps,	7269224
	Land and Assessed Taxes,	3104020
	Property-tax,	15137996
	Post-office,	2992000
	Crown Lands,	273654
	Miscellaneous,	1677096
	Whole revenue,	70390343
	Expenditure,	70354246
	Surplus,	£36097

(2) $23\frac{1}{2} + 20 = 43\frac{1}{2} \therefore 43\frac{1}{2} \times 14 = 609$

$23\frac{1}{2} - 20 = 3\frac{1}{2} \therefore 3\frac{1}{2} \times 14 = 49$

(3) 192 yd. at 15*s.* 6*d.* = £148, 16*s.*

(4)

$$\frac{6000}{4} = \overset{£}{1500}$$

$$\frac{6000}{6} = 1000$$

$$\begin{array}{rll} \overline{2500} = & \text{annual} & \text{gain.} \\ 3000 = & \quad '' & \text{expenditure.} \\ \hline 500 = & \quad '' & \text{debt.} \end{array}$$

$$\therefore \text{Ans.} = \frac{8000}{500} = 16 \text{ years.}$$

(5) $\text{Divisor} = \dfrac{108 \times 25}{6} = 450$

$\text{Integral quot.} = 450 \times 5 = 2250$

$\text{Dividend} = 2250 \times 450 + 108 = 1012608$

(6)
250)800000000
6,0)320000 0 min.
10)53333 20
365)5333 3
14 yr. 223 days 3 hr. 20 min.

(7)
£ s. d.
18 gal. at 15*s.* 9*d.* = 14 3 6
3 gal. . . = 0 0 0
21 gal. 21)14 3 6
£0 13 6

(8)
£ s. d.
14½)27 7 4½
2) 2
29)54 14 9
12)1 17 9 = price per dozen.
£0 3 1¾ = 〃 per bottle.

(9)
£150 = 72000 h.p. 2½*d.* = 5 h.p.
∴ 5)72000
365)14400 days.
39 yr. 165 days.

(10)
From May 15 to Jan. 20 = 250 days.

∴ 365 : 250 :: £15 10*s.*

$$\frac{\pounds 15\ 10s. \times 250}{365} = \frac{\pounds 15\ 10s. \times 50}{73} = \frac{\pounds 775}{73} = \pounds 10\ 12s.\ 3\tfrac{3}{4}\tfrac{67}{73}d.$$

(11) The merchant owes—

	£	s.	d.
A,	500	10	0
B,	350	15	6
C,	245	0	6½
D,	56	18	1½
E,	337	1	8
	£1490	5	10 = 1430680f.

	£	s.	d.
Cash,	192	7	1
Effects,	739	1	6¾
	£931	8	7¾ = 894175f.

∴ 1430680 : 894175 :: 20*s.* : 12*s.* 6*d.*

(12)

		£	s.	d.
300 bar. at £3, 18*s.* 6*d.*	=	1177	10	0
450 yd. at 2*s.* 7½*d.*	=	59	1	3
1200 yd. at 16*s.* 4*d.* .	=	980	0	0
Insurance, &c. .	=	53	18	6
Whole sum expended,	=	£2270	9	9
Money received, .	=	2463	17	9
∴ Gain, . .	=	£193	8	0

£ s. d. £ s. £ £ s. d.
2270 9 9 : 193 8 :: 100 : 8 10 4¼ $\frac{48827}{181639}$

(13)

		£	s.	d.
1200 qr. at £2, 6*s.* 10*d.*	=	2810	0	0
600 qr. at £1, 5*s.* 6*d.*	=	765	0	0
400 yd. at 15*s.* 3¾*d.*	=	306	5	0
Insurance on £2200 at 2 guin. per cent.	=	46	4	0
Policy-duty on £2200 at 5*s.* per cent.	=	5	10	0
Other charges, ...	=	118	10	0
Money laid out, ...	=	£4051	9	0
Money received, ...	=	4000	0	0
∴ Loss, ...	=	£51	9	0

(14)

		£	s.	d.		
90 gal. at 8*s.* 6*d.* per gal.	=	38	5	0	=	P.C.
3840 gills at 3½*d.* . .	=	56	0	0	=	S.P.
∴ Gain, .	=	£17	15	0		

(15)

		£	s.	d.		s.
310 reams at 17*s.* 6*d.* per ream,	=	271	5	0		
Gain, ...	=	26	0	0		
		£297	5	0	=	5945

s. s. d.
∴ 310 : 1 :: 5945 : 19 7¾ $\frac{82}{155}$
(100 : 102½)
200 : 205

(16) 460 lb. of silk at £1, 6*s*. 4*d*. = £605 13*s*. 4*d*.

Loss, . . . = 17 17 0

460)623 10 4

£1 7 $1\frac{1}{4}\frac{29}{115}$

£ *s*. *d*. : £ *s*. :: £ : £ *s*. *d*.

623 10 4 : 17 17 :: 100 : 2 17 $3\frac{0}{4}\frac{10572}{37411}$

(17) 32 bales at £172, 5*s*. 10*d*. . . = £5513 6*s*. 8*d*.

Commission on £5513, 6*s*. 8*d*. at 6 p. c. = 330 16 0

Net proceeds, . . . = 5182 10 8

The half is . . . = 2591 5 4

s. *d*. : £ *s*. *d*. :: gal. : gal.

13 6 : 2591 5 4 :: 1 : $3838\frac{74}{81}$

£ *s*. : £ *s*. *d*. :: cwt. : cwt.

2 10 : 2591 5 4 :: 1 : $1036\frac{38}{75}$.

(18) 7800 lb. at 1*s*. $3\frac{1}{2}$*d*. per lb. = £503 15*s*. 0*d*.

lb. d.

$1 \times 7\frac{1}{2} = 7\frac{1}{2}$

$1 \times 57 = 57$

∴ $64\frac{1}{2}$: £503 15*s*. :: 1 lb. : $1874\frac{18}{43}$ lb.

(19) 345 loads at £7, 9*s*. 6*d*. . = £2578 17*s*. 6*d*.

One-third of the value in cash, = 859 12 6

£1719 5 0

loads. *s*. *s*.

$11 \times 75 = 825$

$3 \times 245 = 735$

1560 : £1719 5*s*. :: 11 loads : $242\frac{11}{24}$ loads.

1560 : 1719 5 :: 3 : $66\frac{1}{8}$

(20) *s.* *d.* 10 6 : *s.* 12 :: *s.* *d.* 1 9 : *s.* 2

(21)

	£	*s.*	*d.*
272 lb. at 5*s.* 6*d.* =	74	16	0
148 lb. at 4*s.* =	29	12	0
256 lb. at 3*s.* 8*d.* =	46	18	8
Value of A's goods =	151	6	8
	77	11	3
Balance . =	£73	15	5

	£	*s.*	*d.*
1340 lb. at 8½*d.* =	47	9	2
1156 lb. at 6¼*d.* =	30	2	1
Value of B's goods =	77	11	3

(22)

$$\frac{1}{3} \text{ of } £8190 \;.\;.\;.\; = £2730$$

$$\frac{1}{10} \text{ of } 8190 \;.\;.\; = 819$$

First received . = £3549

$$\frac{1}{4} \text{ of } £8190 \;.\;.\; = £2047 \; 10s.$$

$$\frac{1}{10} \text{ of } 8190 \;.\;.\; = 819 \; 0$$

Second received = £2866 10

$$\frac{1}{6} \text{ of } £8190 = £1365 = \text{third's share.}$$

$$\frac{1}{3} + \frac{1}{10} + \frac{1}{4} + \frac{1}{10} + \frac{1}{6} = \frac{57}{60} = \frac{19}{20}$$

$$\therefore 1 - \frac{19}{20} = \frac{1}{20} = \text{part the fourth received,}$$

$$\text{and } \frac{1}{20} \text{ of } £8190 = £409 \; 10s. = \text{fourth's share.}$$

(23)

	£	
Stock,	5680	7
Capital,	4000	5
Gain,	1680	12

∴ 12 : 7 :: £1680 : £980 = A's share.
12 : 5 :: 1680 : 700 = B's share.

(24) $\frac{2}{9} = \frac{10}{45}$ $\qquad \frac{8}{45}$ value $= \overset{£}{400}$ = C's share.

$\frac{3}{5} = \frac{27}{45}$ $\qquad \frac{10}{45}$ „ $= 500$ = A's „

$1 - \frac{37}{45} = \frac{8}{45}$ C's part. $\frac{27}{45}$ „ $= 1350$ = B's „

(25) $5\frac{3}{8}$ cwt. at $6\frac{3}{4}d.$ per lb. $= \overset{£}{18}\ \overset{s.}{1}$

$\therefore \overset{s.}{8\frac{5}{8}} : \overset{£}{18}\ \overset{s.}{11} :: \overset{lb.}{1} : \overset{lb.}{43\frac{1}{69}}$

(26) $\overset{£}{3{\cdot}646875} \div 48{\cdot}625 = \overset{£}{{\cdot}075} = \overset{s.}{1}\ \overset{d.}{6}$

(27) $28 \times 6 = 168$
$36 \times 6 = 216 \therefore$ distance $= (168^2 + 216^2)^{\frac{1}{2}}$
$= (28224 + 46656)^{\frac{1}{2}} = 74880^{\frac{1}{2}} = 273{\cdot}642102$ miles.

(28) $(10000 + 16656 + 20000)^{\frac{1}{3}} = 46656^{\frac{1}{3}} = 36$

(29)

12 mats at 25 guilders $= \overset{\text{guil.}}{300}$; $\frac{680 \times 5}{4} = \overset{\text{spin.}}{850}$; $850 \times 3\frac{1}{5} = \overset{\text{yd.}}{2720}$

		£	s.	d.
300 guild. at 1*s.* 11¾*d.* .	=	29	13	9
Dressing, . . .	=	6	10	0
850 spindles at 1*s.* 4¼*d.*	=	57	11	0½
Weaving 2720 yd. at 5¾*d.*	=	65	3	4
Bleaching 2720 yd. at 2½*d.*	=	28	6	8
Sum laid out, .	=	£187	4	9½
455 lb. tow at 5½*d.* .	=	10	8	6½
680 yd. linen at 1*s.* 9*d.*	=	59	10	0
680 yd. „ at 1*s.* 8*d.*	=	56	13	4
1860 yd. „ at 1*s.* 6*d.*	=	102	0	0
Money received,	=	£228	11	10½
		187	4	9½
∴ Gain, . .	=	£41	7	1

(30) $\overset{\text{ft.}}{68} \times \overset{\text{ft.}}{33} \times \overset{\text{ft.}}{5} = \overset{\text{solid ft.}}{11220} = \overset{\text{yd.}}{415\frac{5}{9}}$

415$\frac{5}{9}$ yd. at 1s. 3d. = £25, 19s. 5¼d. ⅓

(31)		£	s.	d.
35 bar. beef at £1, 15s. 6d. .	=	62	2	6
16 do. pork at £2, 12s. .	=	41	12	0
175½ cwt. bread at £1, 5s. . .	=	219	7	6
82 bush. peas at 5s. . .	=	20	10	0
26 cwt. 2 qr. 21 lb. at 30s. per cwt.	=	40	0	7½
18 cwt. 3 qr. 16 lb. at 74s. 8d. per cwt.	=	70	10	8
26½ qr. oatmeal at 19s. . .	=	25	3	6
8 cwt. fish at £1, 6s. . .	=	10	8	0
Other articles . . .	=	1	7	3½
Gain . . .	=	185	15	5
Whole sum received .	=	£676	17	6

		£	s.	d.
1 captain at 90s. per month .	=	4	10	0
8 officers at 45s. do. .	=	18	0	0
160 private men at 15s. do. . .	=	120	0	0
Monthly maintenance of the crew costs		£142	10	0

$\therefore \overset{\text{£}}{142}\ \overset{\text{s.}}{10} : \overset{\text{£}}{676}\ \overset{\text{s.}}{17}\ \overset{\text{d.}}{6} :: \overset{\text{mo.}}{1} : \overset{\text{mo.}}{4\frac{3}{4}}$ or $\overset{\text{mo.}}{4}\ \overset{\text{days.}}{21}$

(32) $\overset{\text{ft.}}{14}\ \overset{\text{in.}}{6} \times \overset{\text{in.}}{9\frac{1}{2}} = \overset{\text{ft.}}{11}\ \overset{'}{5}\ \overset{''}{9} = 1\overset{''}{6}53$ = contents of a deal.

$\overset{\text{ft.}}{70} \times \overset{\text{ft.}}{30} = \overset{\text{ft.}}{2100} = 30\overset{''}{2}400$ = ... floor.

$$\therefore \frac{302400}{1653} = 182\frac{518}{551} \text{ deals.}$$

(33) $\overset{\text{ft.}}{14}\ \overset{\text{in.}}{9} \times \overset{\text{ft.}}{2}\ \overset{\text{in.}}{3} \times 11 = \overset{\text{ft.}}{365}\ \overset{'}{0}\ \overset{''}{9}$ contents of the deals.

365 ft. 0¾′ at 1½d. per ft. = £2, 5s. 7½d. ⅜

(34)

$\overset{\text{yd.}}{28} \times \overset{\text{yd.}}{3\frac{1}{2}} = \overset{\text{yd.}}{98}$

$18 \times 3\frac{1}{2} = 63$

$12 \times 3\frac{1}{4} = 39$

$14 \times 3 = 42$

$10 \times 3 = 30$

EXPENSES.

		£	s.	d.
16 stones at 5s. 8d.	=	4	10	8
30 pints at 1s. 3d.	=	1	17	6
Sundries	=	0	16	0
Whole expense,		7	4	2
272 at 9½d. . .	=	10	15	4
		£3	11	2

(35) $\dfrac{3960 \times 66\frac{1}{2}}{9}$ = 29260 yd. at 6½d. = £792, 9s. 2d.

(36) $350 \times 5 = £1750$
20 crowns = 5
$£1755 \therefore \frac{1755 \times 20}{21} = 1671$ guin. 9s.

(37) $100 : 120 :: 30d. : 36d.$
$\therefore \frac{144}{36} = 4$, number required.

(38)
210 yd. at 7s. 2d. = £75 5s.
150 yd. at 9s. = 67 10
£142 15 = S. P.
360 yd. at 5s. 4d. = 96 0 = P. C.
∴ £46 15 = Gain.

£96 : £46 15s. :: £100 : £48 13s. 11½d.

(39)
Cash left . . . . . £1500 0s. 0d.
5 bills of £48. 10s. 6d. each = 242 12 6
£1742 12 6

Funeral expenses £29 0s.
Debts . . . 464 10
493 10 0
Net proceeds . . . 1249 2 6
⅓ of £1249. 2s. 6d. = 416 7 6 = eldest son's share.
4)832 15 0
Each of the others receive. £208 3 9

(40)
$\frac{1}{2} = \frac{30}{60}$
$\frac{1}{3} = \frac{20}{60}$
$\frac{1}{4} = \frac{15}{60}$
$\frac{1}{5} = \frac{12}{60}$
$\frac{77}{60}$

For when fractions have a common denominator, they are proportional to their numerators.

∴ 77 : 30 :: 21s. : 8s. 2d. $\frac{8}{11}$ = A's share.
77 : 20 :: 21 : 5 5¼ $\frac{9}{11}$ = B's "
77 : 15 :: 21 : 4 1 $\frac{4}{11}$ = C's "
77 : 12 :: 21 : 3 3¼ $\frac{1}{11}$ = D's "

(41)

		£	s.	d.
Rent	=	317	10	6
4 men-servants at £20 each	=	80	0	0
3 maid-servants at £14	=	42	0	0
6 horses at £25 each .	=	150	0	0
Reapers' wages . .	=	60	0	0
Tear and wear of implements	=	30	15	0
Money laid out .	=	£680	5	6

		£	s.	d.
115 qr. wheat at £2, 10s. per qr.	=	287	10	0
120 qr. barley at £1, 15s. ...	=	210	0	0
275 qr. oats at 20s. 8d. ...	=	284	3	4
3000 stones hay at 8d. per stone	=	100	0	0
Other articles . .	=	96	15	0
Money received .	=	978	8	4
... laid out . .	=	680	5	6
∴ Profit . .	=	£298	2	10

(42)

		£	s.	d.
300 × 25½ = 7650 yd. at 2s. 7½d.	=	1004	1	3
300 pieces at 3½d.	=	4	7	6
Money laid out	=	£1008	8	9

	ru. an.		rupees.
7650 yd. at	1 12	=	13387½
Com. at 5 p. c.		=	669⅜

Nett proceeds = 12718⅛ at 2s. 1½d. = 1351 6 $0\frac{0}{4}$ $\frac{3}{4}$

∴ Gain . = £342 17 $3\frac{0}{4}$ $\frac{3}{4}$

(43)

$$\text{Distance} = \frac{(2 + 200) \times 100}{2} = 202 \times 50 = \overset{\text{yd.}}{10100} = \overset{\text{m.}}{5}\ \overset{\text{yd.}}{1300}$$

(44)

	hr.	min.
The first fills the half in .	5	0

$\frac{1}{10} + \frac{1}{8} = \frac{9}{40}$ part filled by the two in 1 hr.

$$\therefore \frac{9}{40} : \frac{1}{2} :: \overset{\text{hr.}}{1} : 2\ 13\tfrac{1}{3}$$

Whole time of filling the tank = 7 13⅓

(45)

$$\text{An. pension} = \frac{a_{45} \times 300}{a_{45}+a_{40}-a_{40,\,45}} = \frac{12{\cdot}648 \times 300}{12{\cdot}648+13{\cdot}390-10{\cdot}598} =$$

$$\frac{3794{\cdot}4}{26{\cdot}038-10{\cdot}598} = \frac{3794{\cdot}4}{15{\cdot}44} = \overset{\pounds}{245{\cdot}751} = \overset{\pounds}{245}\ \overset{s.}{15}\ \overset{d.}{0\tfrac{1}{4}}$$

(46)

$$\frac{7000 \times 6}{100} - 240 = 420 - 240 = \overset{\pounds}{180}$$

$$\frac{1{\cdot}06^{16}-1}{{\cdot}06} \times 180 = \frac{2{\cdot}5403517-1}{{\cdot}06} \times 180 = \overset{\pounds}{4621{\cdot}055}$$

Principal . . . = 7000

11621·055 =
£11621, 1s. 1¼d.

(47)

		£	s.
500 at 3s. 6d. . . .	=	87	10
500 at 2s. 6d. . . .	=	62	10
500 at 1s. . . .	=	25	0
Annual income . .	=	£175	0
Stipend . . .	=	100	0

∴ 1200 : 100 : : 75 : £6, 5s.

(48)

$$\frac{2000 \times 600}{16} = \overset{\text{sheets.}}{75000} \therefore \frac{75000}{500} = 150 \text{ reams of paper}; \ \frac{600}{16} = 37\tfrac{1}{2}$$

		£	s.	d.
150 reams at 12s. . .	=	90	0	0
600 pages at 1s. . .	=	30	0	0
150 reams at 2s. 6d. .	=	18	15	0
37½ sheets at 5s. . .	=	9	7	6
2000 copies at 8½d. .	=	70	16	8
Other expenses . .	=	3	19	2
		£222	18	4
Profit .	=	222	18	4
	2000)	445	16	8
		£0	4	5½

(49)

From Feb. 4 to Nov. 11 = 280 days
Deduct . = 40 Sundays
240

From Nov. 11 to Feb. 4 = 85 days
Deduct . = 12 Sundays
73

Mason's Income.

	£	s.	d.
240 days at 2s. 6d. =	30	0	0
73 days at 2s. =	7	6	0
	£37	6	0

Labourer's Income.

	£	s.	d.
240 days at 1s. 8d. =	20	0	0
73 days at 1s. 4d. =	4	17	4
	£24	17	4

Miner's Income.

	£	s.	d.
240 days at 2s. . . . =	24	0	0
73 days at 1s. 8d. . . =	6	1	8
	£30	1	8

(50)

$\frac{3}{5}$ of $\frac{3}{4} = \frac{9}{20}$ $\therefore \frac{9}{20} : \frac{20}{20} :: $ £1710 : £3800

(51)

	£	s.
16 tons at £36 =	576	0
32 do. at £20 =	640	0
24 hands at £20, 16s. =	499	4
Other expenses* =	205	0
Interest on £2500 at 5 per cent. =	125	0
	£2045	4

	£	s.
500 reams at 21s. =	525	0
800 do. at 18s. =	720	0
1200 do. at 15s. =	900	0
1600 do. at 10s. 6d. =	840	0
650 do. at 7s. 6d. =	243	15
	£3228	15
Duty at 20 per cent.	645	15
Nett proceeds, .	2583	0
	2045	4
∴ Gain =	£537	16

(52)

	£	s.
130 ac. at 15s. =	97	10
200 ac. at 12s. =	120	0
250 ac. at 9s. =	112	10
	2)330	0
	£165	0

£ s. ac. ro.
97 10 is the value of 130 0
165 0

ac.
120 : 67 10 : : 200 : 112 2

∴ Elder sister's share, 242 2
Whole extent, . 580 0

Younger sister's share, 337 2

(53)

		£
200 qr. of corn at 22s. . .	=	220
Loss	=	80
Prime cost of 200 qr. . .	=	£300

qr. qr.
∴ 300 : 1200 : : 200 : 800

£ £ s.
800 : 1 : : 1200 : 1 10 = P. C. per qr.

	£
800 qr. cost .	1200
200 qr. were sold for	220
	£980
Gain =	100

£ s.
600 : 1 : : 1080 : 1 16 = S. P. per qr.

(54)

Number of grains $= 2^{64} - 1 = 18446744073709551615$

512 pints = 1 qr., and £1, 7s. 6d. $= \frac{11}{8}$£

$$\therefore \text{Value} = \frac{18446744073709551615 \times 11}{7680 \times 512 \times 8}$$

$$= \frac{3689348814741910323 \times 11}{1536 \times 512 \times 8}$$

£ s. d.
$= \frac{40582836962161013553}{6291456} =$ 6450468216285 17 3¾ [illegible]

(55)

ft. mile. yd. ft.
1142 × 7 = 7994 = 1 904 2

(56)

Assets.		£	s.	d.
765 yards at 2*s.* 2*d.*	=	82	17	6
372 yards at 2*s.* 6*d.*	=	46	10	0
465 yards at 2*s.* 8*d.*	=	62	0	0
82×43½ = 3567 yards at 10½*d.* per yd.	=	156	1	1½
369½ yards broadcloth at 19*s.* 6*d.* .	=	360	5	3
374 yards narrow do. at 7*s.* 6*d.* . .	=	140	5	0
37 yards at 7*s.*	=	12	19	0
37 yards at 6*s.* 3*d.*	=	11	11	3
37 yards at 4*s.* 7*d.*	=	8	9	7
37 yards at 3*s.* 9*d.*	=	6	18	9
37 yards at 2*s.* 6*d.*	=	4	12	6
Value of other articles, . . .	=	1379	17	4
Book-debts, ...	=	1000	0	0
Cash on hand, ...	=	1780	0	0
		£5052	7	3½

Liabilities.	£	s.	d.			
Debts due by him, . .	2300	0	0			
Int. on £2000 at 5 per cent.	100	0	0			
				2400	0	0
Surplus, ...				£2652	7	3½
Deduct capital at commencement, =				2000	0	0
Profit, ...				£652	7	3½

(57)

cwt. qr. lb. = 42 3 12 = 4800 lb.; ⅓ of 4800 = 1600 lb.; ⅔ of 4800 . = 3200 lb.

Outcome = 200 Loss, 2 oz. per lb. = 400

∴ Quantity of tobacco, 1800 ∴ Quant. of snuff, = 2800

		£	s.	d.
4800 lb. at 5¾*d.*	=	115	0	0
Duty on 4800 lb. at 1*s.* 9*d.* per lb.	=	420	0	0
Twisting 1800 lb. at 1½*d.* per lb. .	=	11	5	0
Manufacturing 2800 lb. at 1*d.* .	=	11	13	4
Money laid out, . . .	=	£557	18	4

		£	s.			
900 lb. at 3*s.* 2*d.* .	=	142	10			
900 lb. at 2*s.* 10*d.* .	=	127	10			
1400 lb. at 3*s.* .	=	210	0			
1400 lb. at 2*s.* 6*d.* .	=	175	0			
∴ Money received,	=			655	0	0
∴ Gain, .	=			£97	1	8

(58)

		£	s.	d.
54 dozen of wine at 36s. per dozen . .	=	97	4	0
Cellar rent	=	0	15	0
Interest on £97, 4s. for 2 years, at 5 per cent.	=	9	14	$4\frac{3}{4}\frac{1}{5}$
		£107	13	$4\frac{3}{4}\frac{1}{5}$
52 dozen at 41s. per dozen	=	106	12	0
∴ Loss . .	=	£1	1	$4\frac{3}{4}\frac{1}{5}$

(59)

Last term $= 12 + 37 \times 15 = 567$; sum $= \dfrac{(12 + 567) \times 38}{2}$

$= 579 \times 19 = 11001$

(60)

Suppose A pays £15 ∴ $60 : 120 :: 15 : 30$

∴ B $15 + \dfrac{15}{3} = 20$ $\qquad 60 : 120 :: 20 : 40$

C $20 + \dfrac{20}{4} = 25$ $\qquad 60 : 120 :: 25 : 50$

$\overline{60}$

(61)

Last term $= 19 \times 13^7 = 19 \times 62748517 = 1192221823$

Sum . $= \dfrac{19 \times (13^8 - 1)}{13 - 1} = \dfrac{19 \times 815730720}{12} = 19 \times 67977560$

$= 1291573640$

(62)

Suppose 7 oz. = wt. of the less
5 = ... cover
2)12
6 = wt. of the greater
5 = ... cover
11
7 × 3 = 21
+10

Suppose 9 oz. = wt. of the less
5 = ... cover
2)14
7 = wt. of the greater
5 = ... cover
12
9 × 3 = 27
+15

$15 - 10 : 9 - 7 :: 10 : 4$ correction.
7
3 = weight of the less
5 = ... cover
2)8
4 = ... greater.

(63) $$\text{Sum} = \frac{(2+10)\times 17}{2} = 6 \times \overset{s.}{17} = \overset{s.}{102} = \overset{£}{5}\ \overset{s.}{2}$$

(64) $$\text{Value in farthings} = 2^{24} - 1 = \overset{f.}{16777215} = \overset{£}{17476}\ \overset{s.}{5}\ \overset{d.}{3\tfrac{3}{4}}$$

(65)

$$\begin{array}{rr@{\quad}rr}
 & s. & & s. \\
\text{Suppose 20 gal. at 8}s. = & 160 & \text{Sup. 40 gal. at 8}s. = & 320 \\
\text{40 gal. at 10}s. = & \underline{400} & \text{20 gal. at 10}s. = & \underline{200} \\
 & 560 & & 520 \\
\text{60 gal. at 8}s.\ 6d. = & \underline{510} & \text{60 gal. at 8}s.\ 6d. = & \underline{510} \\
 & +50 & & +10
\end{array}$$

$$\begin{array}{l}
50 - 10 \ :\ 40 - 20 \ ::\ 50 \ :\ 25 = \text{correction.} \\
\hphantom{50 - 10 \ :\ 40 - 20 \ ::\ 50 \ :\ } \underline{20} \\
\hphantom{50 - 10 \ :\ 40 - 20 \ ::\ 50 \ :\ } 45 \text{ at } 8s. \\
\hphantom{50 - 10 \ :\ 40 - 20 \ ::\ 50 \ :\ } 15 \text{ at } 10s.
\end{array}$$

Otherwise:

8*s.* = 16 sixp., 10*s.* = 20 sixp., and 8*s.* 6*d.* = 17 sixp.

$$17 \begin{cases} 16 \\ 20 \end{cases} \begin{array}{l} 3 \times 15 = 45 \text{ at } 8s. \\ 1 \times 15 = \underline{15} \text{ at } 10s. \\ \hphantom{1 \times 15 = }\ 60 \end{array}$$

$$4\overline{)60}$$
$$\overline{15}$$

(66)

£		£
1500000 in shares at 6 per cent. . .	=	90000
500000 on debenture at 5 per cent. .	=	25000
Money required for dividend and interest,	=	£115000
Working expenses (55 : 45 :: 11500), .	=	$94090\frac{10}{11}$
Annual revenue, . . .	=	$£209090\frac{10}{11}$

$$\therefore \text{Weekly receipts} = \frac{209090\frac{10}{11}}{52} = \frac{575000}{143} = \overset{£}{4020}\ \overset{s.}{19}\ \overset{d.}{6\tfrac{3}{4}}\ \tfrac{123}{143}$$

THE END.

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